



COMDTINST M16465.12C

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COMMANDANT INSTRUCTION M16465.12C

Subj: CHEMICAL HAZARD RESPONSE INFORMATION SYSTEM (CHRIS)

1. PURPOSE. This manual provides information needed for decision-making by Coast Guard personnel during emergencies that occur during the waterborne transport of hazardous chemicals. It also provides information that can be used by the Coast Guard as it strives to improve safety procedures and prevent accidents.
2. ACTION. Area and district commanders, commanders of maintenance and logistics commands, commanding officers of headquarters units, assistant commandants for directorates, Chief Counsel, and special staff offices at Headquarters shall ensure that this Manual is available for responders and all others that may benefit from this information.
3. DIRECTIVES AFFECTED. COMDTINST M16465.12B of 2 November 1992, is cancelled.
4. DISCUSSION. This comprehensive edition of CHRIS replaces the earlier 4-volume series. Obsolete information was deleted and 12 new information fields were added to facilitate safe and effective response to hazardous chemical releases. By the end of fiscal year 1999, the manual will be available on CD Rom and as a searchable database on the internet and will be linked to the Coast Guard Marine Safety home page. The address for this page is:  
<http://www.dot.gov/dotinfo/uscg/hq/g-m/gmhome.htm>

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A CD version is free; please send your post office address if you'd like a free copy. Please note that the CD won't work with Windows 2000 or newer software. We have a new version under development, but the new CD won't be ready for some time. Send your address to [Aschneider@comdt.uscg.mil](mailto:Aschneider@comdt.uscg.mil).

**Ordering Information for Coast Guard Units**

Coast Guard units that are authorized to have a paper copy of the Chemical Hazard Response Information System (CHRIS), COMDTINST M16565.12C may order it following the directions in the Directives, Publications, and Reports Index (DPRI), COMDTNOTE 5600. Personal Desk copies are not authorized.

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We are not allowed to give away or sell the personal printed version; you can order it as follows:

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## **1. INTRODUCTION**

The Chemical Hazards Response Information System (CHRIS) is designed to provide information needed for decision-making by responsible Coast Guard personnel during emergencies that occur during the water transport of hazardous chemicals. CHRIS also provides much information that can be used by the Coast Guard in its efforts to achieve better safety procedures and so prevent accidents.

CHRIS consists of a handbook or manual, a hazard assessment computer system (HACS), and technical support personnel located at Coast Guard headquarters. These components and their relations to one another are described in Section 2 of this manual.

## **2. COMPONENTS OF CHRIS**

### **2.1 HAZARDOUS CHEMICAL DATA**

This manual is the cornerstone of CHRIS. For each substance, it lists the specific chemical, physical, and biological data needed for the preparation and use of the other components of the system. The manual can also be used after the initial response action, when there is sufficient time to use more detailed information.

The Hazardous Chemical Data Manual is intended for use primarily by the On-Scene Coordinator (OSC) and by Regional Response Teams for devising, evaluating, and carrying out response plans.

### **2.2 HAZARD ASSESSMENT COMPUTER SYSTEM**

The Hazard Assessment Computer System (HACS) permits trained specialists to obtain very detailed hazard evaluations quickly, when requested by OSC personnel, and can be accessed through the National Response Center.

### 3. EXPLANATION OF TERMS

This section explains the special terms used in the data sheets, gives the sources of specific items, and includes other information that will be useful to the reader in interpreting the data. The paragraphs below are keyed to the relevant portions by the subheading and number used in the data sheets.

The expression “**Not pertinent**” means that the data item either has no real meaning (such as the flash point of a nonflammable chemical) or is not required for assessing a hazardous situation. The expression “**Currently not available**” means that the information sought was not found in the general or specialized data sources listed in Section 10 of this manual. In a few cases where important data were not available, values were estimated by usually reliable procedures; all such values are labeled “**(est.)**”. If more accurate values for those items are found, they will be included in later revisions.

The **name** used for each of the chemicals included in the CHRIS manuals is either (1) that specified in the Code of Federal Regulations, Title 46, Part 151 or (2) a common name for those chemicals not now regulated by Sub chapters O and D but known to be hazardous during shipment. The data sheets are arranged in alphabetic order by chemical name, not by the 3-letter code.

The **3-letter code** is designed to facilitate correct identification of chemicals in oral or written communication. The code should be used only *in addition* to the compound name; it should not be used alone. For transmitting the code, use the phonetic alphabet given in the “International Code of Signals.”

#### 1. RESPONSE TO DISCHARGE

In every case of a discharge or leak, it is obvious that an effort should be made to reduce, stop, or contain the flow of material at its source if this can be done safely. The purpose of the terms used in this section is to describe in a general way the cautionary and corrective responses that are described in greater detail in the Response Methods Handbook.

- “*Issue warning*” is used when the chemical is a *poison*, has a *high flammability*, is a *water contaminant*, is an *air* contaminant (so as to be hazardous to life), is an *oxidizing* material, or is *corrosive*.
- “*Restrict access*” is used only for those chemicals that are unusually and immediately hazardous to personnel unless they are protected properly by respirators, protective clothing, etc.
- “*Evacuate area*” is used primarily for unusually poisonous chemicals or those that ignite easily.
- “*Mechanical containment*” is used for water-insoluble chemicals that float and do not evaporate readily.

- “*Should be removed*” is used for chemicals that cannot be allowed to disperse because of their harmful effect on humans or on the ecological system in general. The term is not used unless there is a reasonable chance of preventing dispersal, after a discharge or leak, by chemical and physical treatment.
- “*Chemical and physical treatment*” is recommended for chemicals that can be removed by skimming, pumping, dredging, burning, neutralization, absorption, coagulation, or precipitation. The corrective response may also include the use of dispersing agents, sinking agents, and biological treatment.
- “*Disperse and flush*” is used for chemicals that can be made non-hazardous to humans by simple dilution with water. In a few cases the response is indicated even when the compound reacts with water because, when proper care is taken, dilution is still the most effective way of removing the primary hazard.

## 2. CHEMICAL DESIGNATIONS

**2.1 Coast Guard Compatibility Classification** - An entry is made when the chemical has been assigned to one of the 43 cargo groups listed in Code of Federal Regulations, Title 46, Part 150, “Compatibility of Cargoes.” Appropriate parts of these regulations are included in this manual. Chemicals included in the regulation were assigned to a group by the Cargo and Hazardous Materials Standards Division, Coast Guard Headquarters. If the chemical is not a liquid carried in bulk in ships' tanks, this data item is “Not listed.”

**2.2 Chemical Formula** - This has been limited to a commonly used one-line formula. In the case of some organic compounds it has not been possible to represent chemical structure within such a limitation.

**2.3 IMO/United Nations Numerical Designation** - The designation is that of the “International Maritime Dangerous Goods Code” published by the International Maritime Organization (IMO), London, 1977.

**2.4 Department of Transportation Identification Number** - This is an identification number assigned by the Department of Transportation to aid in categorizing hazards and recommended responses. The ID's can be located in the Hazardous Materials Table, part 172.101 of 49 CFR.

**2.5 Chemical Abstracts Services Registry Number** - The unique identification number assigned each compound registered with the Chemical Abstracts Service (CAS) is listed to aid in quick identification of the compound.

**2.6 NAERG Guide Number** – The number of the guide in the North American Emergency Response Guidebook listing specific emergency response actions for a particular CHRIS chemical. The 1996 edition of the guidebook was used in the preparation of this edition of the CHRIS manual.

**2.7 Standard Industrial Trade Classification** – The five digit code identifying the chemical's commodity category per revision 3 of the subject classification. These codes are compatible with the International Harmonized System codes used in foreign trade.

### 3. HEALTH HAZARDS

**3.1 Personal Protective Equipment** - The items listed are those recommended by (a) manufacturers, either in technical bulletins or in Material Safety Data Sheets, (b) the Chemical Manufacturers Association, or (c) the National Safety Council, for use by personnel while responding to fire or accidental discharge of the chemical. They are intended to protect the lungs, eyes, and skin. Safety showers and eyewash fountains are considered to be important protective equipment for the handling of almost all chemicals; they are not usually listed.

**3.2 Symptoms Following Exposure** - These are brief descriptions of the effects observed in humans when the vapor (gas) is inhaled, when the liquid or solid is ingested (swallowed), and when the liquid or solid comes in contact with the eyes or skin.

**3.3 Treatment for Exposure** - "First-aid" procedures are recommended. They deal with exposure to the vapor (gas), liquid, or solid and include inhalation, ingestion (swallowing) and contact with eyes or skin. The instruction "Do NOT induce vomiting" is given if an unusual hazard is associated with the chemical being sucked into the lungs (aspiration) while the patient is vomiting. "Seek medical attention" or "Call a doctor" is recommended in those cases where only competent medical personnel can treat the injury properly. In all cases of human exposure, seek medical assistance as soon as possible.

**3.4 Threshold Limit Value – Time Weighted Average** -The Threshold Limit Value Time Weighted Average (TLV-TWA) is usually expressed in units of parts per million (ppm) - i.e., the parts of vapor (gas) per million parts of contaminated air by volume at 25°C (77°F) and one atmosphere pressure. For a chemical that forms a fine mist or dust, the concentration is given in milligrams per cubic meter (mg/m<sup>3</sup>). The TLV is defined as the concentration of the substance in air that can be breathed for five consecutive eight-hour workdays (40-hour work week) by most people without adverse effect (American Conference of Governmental Industrial Hygienists, "Threshold Limit Values for Substance in Workroom Air, Adopted by ACGIH"). As some people become ill after exposure to concentrations lower than the TLV, this value cannot be used to define exactly what is a "safe" or "dangerous" concentration.

No entry appears when the chemical is a mixture; it is possible to calculate the TLV for a mixture only when the TLV for each component of the mixture is known and the composition of the mixture by weight is also known.

**3.5 Threshold Limit Value - Short-Term Exposure Limits** - The parts of vapor (gas per million parts of contaminated air by volume at 25°C (77°F) and one atmosphere pressure is given. The limits are given in milligrams per cubic meter

for chemicals that can form a fine mist or dust. The values given are the maximum permissible average exposures for the time periods specified.

**3.6 Threshold Limit Value – Ceiling Value** – The parts of vapor (gas per million parts of contaminated air by volume at 25°C (77°F) and one atmosphere pressure is given. The limits are given in milligrams per cubic meter for chemicals that can form a fine mist or dust. The values given are for a concentration that is not to be exceeded at any time.

**3.7 Toxicity by Ingestion** - The Grade and corresponding LD<sub>50</sub> value are those defined by the National Academy of Sciences, Committee on Hazardous Materials, "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide," Washington, D.C., 1972. Data were also collected from other sources and converted to the appropriate Grade before entry in this manual. The term LD<sub>50</sub> signifies that about 50% of the animals given the specified dose by mouth will die. Thus, for a Grade 4 chemical (below 50 mg/kg) the toxic dose for 50% of animals weighing 70 kg (150 lb) is 70 X 50 = 3500 mg = 3.5 g, or less than 1 teaspoonful; it might be as little as a few drops. For a Grade 1 chemical (5 to 15g/kg), the LD<sub>50</sub> would be between a pint and a quart for a 150-lb man. All LD<sub>50</sub> values have been obtained using small laboratory animals such as rodents, cats, and dogs. The substantial risks taken in using these values for estimating human toxicity are the same as those taken when new drugs are administered to humans for the first time.

**3.8 Toxicity by Inhalation** – Similar to the Toxicity by Ingestion entry, except that the route of exposure is inhalation instead of ingestion. Units and definition of units are the same.

**3.9 Chronic Toxicity** - Where there is evidence that the chemical can cause cancer, mutagenic effects, teratogenic effects, or a delayed injury to vital organs such as the liver or kidney, a qualitative description of the effect is given.

**3.10 Vapor (Gas) Irritant Characteristics** - The most appropriate of five statements listed below is given. Source: National Academy of Sciences, Committee on Hazardous Materials, "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide," Washington, D.C., 1972.)

- (1) Vapors are nonirritating to eyes and throat.
- (2) Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- (3) Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- (4) Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- (5) Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

**3.11 Liquid or Solid Irritant Characteristics** - The most appropriate of the following five statements is given (same source as 5.8 above):

- (1) No appreciable hazard. Practically harmless to the skin.
- (2) Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- (3) Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- (4) Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.
- (5) Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.

**3.12 Odor Threshold** - This is the lowest concentration in air that most humans can detect by smell. The value cannot be relied on to prevent over-exposure, because human sensitivity to odors varies over wide limits, some chemicals cannot be smelled at toxic concentrations, odors can be masked by other odors, and some compounds rapidly deaden the sense of smell.

**3.13 IDLH Value** - The Immediately Dangerous to Life and Health Value - This concentration represents a maximum level from which one could escape within 30 minutes without any escape-impairing symptoms or any irreversible health effects. The concentrations are reported in either parts per million (ppm) or milligrams per cubic meter ( $\text{mg}/\text{m}^3$ ).

**3.14 OSHA Permissible Exposure Limit – Time Weighted Average** – Similar to the definition of the TLV-TWA above, except that this limit has been promulgated by the Occupational Safety and Health Agency.

**3.15 OSHA Permissible Exposure Limit – Short Term Exposure Limit** – Similar to the definition of the TVL-STEL above, except that this limit has been promulgated by the Occupational Safety and Health Agency.

**3.16 OSHA Permissible Exposure Limit – Ceiling** – Similar to the definition of the TVL-Ceiling above, except that this limit has been promulgated by the Occupational Safety and Health Agency.

**3.17 EPA AEGL** – Acute Exposure Guideline information from the Environmental Protection Agency for the specific compound listed in the manual.

## 4. FIRE HAZARDS

**4.1 Flash Point** - This is defined as the lowest temperature at which vapors above a volatile combustible substance will ignite in air when exposed to a flame. Depending on the test method used, the values given are either Tag closed cup (C.C.) (ASTM D56) or Cleveland open cup (O.C.) (ASTM D93). The values, along with those in 6.2 and 6.7 below, give an indication of the relative flammability of the chemical. In general, the open cup value is about 10° to 15°F higher than the closed cup value.

**4.2 Flammable Limits in Air** - The percent concentration in air (by volume) is given for the lower (LFL) and upper (UFL) limit. The values, along with those in 6.1 and 6.7, give an indication of the relative flammability of the chemical. The limits are sometimes referred to as “lower explosive limit” (LEL) and “upper explosive limit” (UEL).

**4.3 Fire Extinguishing Agents** - The agents are listed in decreasing order of importance. The general capabilities of all agents are described in section 6, “Fire Protection Handbook,” 18th ed., National Fire Protection Association, Boston, Mass., 1997.

**4.4 Fire Extinguishing Agents Not to be Used** - The agents listed must not be used because they react with the chemical and create an additional hazard. In some cases they are listed because they are ineffective in putting out the fire.

**4.5 Special Hazards of Combustion Products** - Some chemicals decompose or burn to give off toxic and irritating gases. Such gases may also be given off by chemicals that vaporize in the heat of a fire without either decomposing or burning. If no entry appears, the combustion products are thought to be similar to those formed by the burning of oil, gasoline, or alcohol; they include carbon monoxide (poisonous), carbon dioxide, and water vapor. The specific combustion products are usually not well known over the wide variety of conditions existing in fires; some may be hazardous.

**4.6 Behavior in Fire** - Any characteristic behavior that might increase significantly the hazard involved in a fire is described. The formation of dense smoke or flammable vapor clouds, and the possibility of polymerization and explosions is stated. Unusual difficulty in extinguishing the fire is also noted.

**4.7 Ignition Temperature** - This is the minimum temperature at which the material will ignite without a spark or flame being present. Along with the values in 6.1 and 6.2 above, it gives an indication of the relative flammability of the chemical. It is sometimes called the “autoignition temperature.” The method of measurement is given in ASTM D-2155.

**4.8 Electrical Hazard** - The ease with which the chemical is ignited by electrical equipment is indicated by the Group and Class assignment made in the National Fire Protection Association, “Hazardous Chemicals Data,” Boston, Mass., 1994 and in “Classification of Gases, Liquids, and Volatile Solids



Relative to Explosion-Proof Electrical Equipment,” National Academy of Sciences, 1982. This information is available for relatively few chemicals, so an absence of data does not necessarily mean that the substance is not hazardous in the presence of electrical equipment.

**4.9 Burning Rate** - The value is the rate (in millimeters per minute) at which the depth of a pool of liquid decreases as the liquid burns. Details of measurement are given by D.S. Burgess, A. Strasser, and J. Grumer, “Diffusive Burning of Liquid Fuels in Open Trays,” Fire Research Abstracts and Reviews, 3, 177 (1961).

**4.10 Adiabatic Flame Temperature** - The value is the temperature in degrees Fahrenheit of the flame when the material is burned under adiabatic conditions.

**4.11 Stoichiometric Air to Fuel Ratio** - The value is the ratio of air to the compound in question required for stoichiometric combustion. Since it is a ratio, the value is dimensionless.

**4.12 Flame Temperature** - The value is the temperature in degrees Fahrenheit of the flame produced by burning the compound under stoichiometric conditions without any rate controls.

**4.13 Molar Ratio (Reactant to Product)** – The number of moles of products formed, assuming complete combustion of a single mole of the chemical reactant. These ratios were calculated assuming there was sufficient oxygen available and that combustion did, in fact, go to completion.

**4.14 Minimum Oxygen Concentration for Combustion (MOCC)** – Information from NFPA-69 regarding the minimum percentage of oxygen required to support combustion of the subject compound. The results are reported for oxygen diluted with nitrogen (N<sub>2</sub>) and/or carbon dioxide (CO<sub>2</sub>).

## 5. CHEMICAL REACTIVITY

**5.1 Reactivity with Water** - The term “No reaction” means that no hazard results when the chemical reacts or mixes with water. Where a hazard does result, it is described.

**5.2 Reactivity with Common Materials** - This is limited to hazardous reactions with fuels and with common materials of construction such as metal, wood, plastics, cement, and glass. The nature of the hazard, such as severe corrosion or formation of a flammable gas, is described.

**5.3 Stability During Transport** - The term “Stable” means that the chemical will not decompose in a hazardous manner under the conditions of temperature, pressure, and mechanical shock that are normally encountered during shipment; the term does not apply to fire situations. Where there is a possibility of hazardous decomposition, an indication of the conditions and the nature of the hazard is given.

**5.4 Neutralizing Agents for Acids and Caustics** - In all cases involving accidental discharge, dilution with water may be followed by use of the agent specified, particularly if the material cannot be flushed away; the agent specified need not necessarily be used.

**5.5 Polymerization** - A few chemicals can undergo rapid polymerization to form sticky, resinous materials, with the liberation of much heat. The containers may explode. For these chemicals the conditions under which the reaction can occur are given. See Section 12.16 for quantitative data.

**5.6 Inhibitor of Polymerization** - The chemical names and concentrations of inhibitors added by the manufacturer to prevent polymerization are given.

## 6. WATER POLLUTION

**6.1 Aquatic Toxicity** - The form of data presentation used by the Environmental Protection Agency's "Oil and Hazardous Material-Technical Assistance Data System (OHM-TADS)" is used here. Reading from left to right and separated by slashes (/) are the following data:

Concentration in parts per million by weight (or milligrams per liter)  
at which the chemical was tested;  
Time of exposure in hours;  
Name of the aquatic species studied;  
Effect observed;  $LC_{50}$  means that approximately 50% of the fish will die under the conditions of concentrations and time given.  $TL_m$  (Median Tolerance Limit) means that approximately 50% of the fish will show abnormal behavior (including death) under the conditions of concentrations and time given; the term  $EC_{50}$  (Effective Concentration<sub>50</sub>) is used sometimes instead of  $TL_m$ ;  
The kind of water used in the test (fresh or salt)

Some chemicals have been tested with many species of fish. Where the data were available, the data sheet cites one illustrative test in fresh water and one in salt water.

**6.2 Waterfowl Toxicity** - Very little information is available. In a few cases there is entered the  $LD_{50}$  value, which indicates the dose (in milligrams per kilogram of body weight) that is lethal to about half the waterfowl tested.

**6.3 Biological Oxygen Demand (BOD)** - Also called "biochemical oxygen demand," this is a standard way of describing how much oxygen dissolved in water is consumed by biological oxidation of the chemical during the stated period of time. The unit lb/lb indicates the pounds of oxygen consumed by each pound of chemical during the time stated. When given in percent, the values indicate the pounds of oxygen consumed by each 100 pounds of chemical during the time stated. If the percentage is followed by "(theor.)", it indicates the

pounds of oxygen theoretically required to completely oxidize 100 pounds of the chemical.

**6.4 Food Chain Concentration Potential** - If the chemical is consumed by fish, marine plants, waterfowl, etc., that are in turn eaten by other species, the substance may accumulate and ultimately be consumed by humans. Where this occurs, an indication of the potential hazard and its significance is given.

**6.5 GESAMP Hazard Profile** – A composite list of hazard profiles evaluated by the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP). A summary of the legends used in the profile follows.

**Bioaccumulation and Tainting**

+	Bioaccumulated to significant extent and known to produce a hazard to aquatic life or human health.
Z	Bioaccumulated with attendant risk to aquatic organisms or human health, however, with short retention of the order of one week or less.
T	Liable to produce tainting of seafood.
O	No evidence to support one of the above ratings (+, Z, T)

**Damage to Living Resources**

**96 hr LC<sub>50</sub>**

5	Extremely toxic	less than 0.01 mg/l
4	Highly toxic	less than 1 mg/l
3	Moderately toxic	1-10 mg/l
2	Slightly toxic	10-100 mg/l
1	Practically nontoxic	100-1000 mg/l
0	Non-hazardous	greater than 1000 mg/l
D	Substance likely to blanket the sea-bed	
BOD	Substance with oxygen demand	

**Hazard to Human Health by Oral Intake**

**LD<sub>50</sub>**

4	Highly hazardous	less than 5 mg/kg
3	Moderately hazardous	5-50 mg/kg
2	Slightly hazardous	50-500 mg/kg
1	Practically non-hazardous	500-5000 mg/kg
0	Non-hazardous	greater than 5000 mg/kg

**Hazard to Human Health by Skin and Eye Contact or Inhalation**

II	Hazardous (severe irritation, strong sensitizer, lung injury, percutaneous toxicity, carcinogenic, or other specific long-term
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adverse health effect.

- I Slightly hazardous (mild irritation, weak sensitizer)
- 0 Non-hazardous (non-irritant, not a sensitizer)

#### **Reduction of Amenities**

- XXX Highly objectionable because of persistency, smell or poisonous or irritant characteristics; as a result contaminated beaches liable to be closed; also used when there is clear evidence that the substance is a human carcinogen or that the substance has the potential to produce other serious specific long-term adverse health effects in humans.
- XX Moderately objectionable because of the above characteristics, but short-term effects leading only to temporary interference with use of beaches; also used when there is credible scientific evidence that the substance is an animal carcinogen but where there is no clear evidence to indicate that the material has caused cancer in humans, or when there is evidence from laboratory studies that the substance could have the potential to produce other serious specific long-term adverse health effects.
- X Slightly objectionable, non-interference with use of beaches.
- 0 No problem.

Ratings in brackets, ( ), indicate insufficient data available to the GESAMP experts on specific substances, hence extrapolation was required.

N – Not applicable (e.g. if gases)

— Indicates data were not available to the GESAMP Working Group.

## **7. SHIPPING INFORMATION**

**7.1 Grades or Purity** - The grades USP (United States Pharmacopoeia) and CP (chemically pure) are quite pure. Where “Technical” or “Commercial” grades are given, the percent by weight of the pure chemical present is usually indicated. In a few cases the identity of the major impurities is given. If the properties of the less pure grades differ significantly from those of the pure substance, the differences in properties are described in general terms.

**7.2 Storage Temperature** - The range of temperatures at which the chemical is normally shipped in bulk by water transport is given. “Ambient” means the temperature of the surroundings.

**7.3 Inert Atmosphere** - The terms used are “inerted,” “padded,” “ventilated (forced),” “ventilated (natural),” and “no requirement.” They are given when found in the Code of Federal Regulations, Title 46, beginning in Part 151.05.

**7.4 Venting** - The terms used are “open,” “pressure-vacuum,” and “safety relief” (same source as 9.3 above).

**7.5 IMO Pollution Category** – pollution classification applied to this compound by the International Maritime Organization.

**7.6 Ship Type** – The data entry refers to construction and containment requirements for ships being used to transport the chemical in question. The information is taken from the Code of Federal Regulations, Title 46, Part 154.

**7.7 Barge Hull Type** – The data entry refers to structural requirements for barge hulls being used to transport the chemical in question. The information is taken from the Code of Federal Regulations, Title 46, part 151.

## **8. HAZARD CLASSIFICATIONS**

**8.1 49 CFR Category** - This is the hazard category specified in the Hazardous Materials Table, Part 172.101, Title 49 of the Code of Federal Regulations. The October 1, 1996 edition was used to prepare this version of the CHRIS.

**8.2 49 CFR Class** – The hazard class as specified in the Hazardous Materials Table, Title 49, Part 172.101 of the Code of Federal Regulations. The October 1, 1996 edition was used to prepare this version of the CHRIS.

**8.3 49 CFR Package Group** – The packaging group assigned to this chemical in the Hazardous Materials Table, Title 49, Part 172.101 of the Code of Federal Regulations. The October 1, 1996 edition was used to prepare this version of the CHRIS. Note that the packaging group is often dependent upon toxicity or flash point of the chemical. In those cases the reported packaging group is based upon the data value reported in CHRIS for that specific compound. The packaging group could be different if the purity of the material varies from that reported in CHRIS.

**8.4 Marine Pollutant** – This is a “Yes” or “No” entry, depending upon whether the chemical is listed in “List of Marine Pollutants”, Appendix B to Part 172.101, Title 49 of the Code of Federal Regulations.

**8.5 NFPA Hazard Classifications** - The indicated ratings are given in “Fire Protection Guide on Hazardous Materials,” 7th ed., National Fire Protection Association, Boston, Mass., 1978. The classifications are defined in Table 1 below. The symbol used in conjunction with these ratings is illustrated in Section 4.2.

**8.6 EPA Reportable Quantity** – The minimum quantity, in pounds, that must be reported to EPA in the event of a spill. This value is taken from “A List of Hazardous Substances and Reportable Quantities”, Appendix A to Part 172.101, Title 49 of the Code of Federal Regulations.

**8.7 EPA Pollution Category** – An alphabetic descriptor identifying the potential pollution impact of the chemical. This descriptor is based upon the reportable quantity from category 8.6 above.

**8.8 RCRA Waste Number** – The 4 character identification number assigned to this chemical, if it is a waste, under the Resources Conservation and Recovery Act. This waste number was reported if the chemical is specifically listed.

**8.9 EPA FWPCA List** – A “Yes” or “No” entry depending upon whether the chemical is listed in the Federal Water Pollution Control Act.

**TABLE 1**  
**EXPLANATION OF NFPA HAZARD CLASSIFICATIONS**

<b>Health Hazard (blue)</b>		<b>Definition</b>
4		Materials which on very short exposure could cause death or major residual injury even though prompt medical treatment were given
3		Materials which on short exposure could cause serious temporary or residual injury even though prompt medical treatment were given.
2		Materials which on intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given.
1		Materials which on exposure would cause irritation but only minor residual injury even if no treatment is given.
0		Materials which on exposure under fire conditions would offer no hazard beyond that of ordinary combustible material.
<b>Flammability (red)</b>		
4		Materials which will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature, or which are readily dispersed in air and which will burn readily.
3		Liquids and solids that can be ignited under almost all ambient temperature conditions
2		Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.
1		Materials that must be preheated before ignition can occur.
0		Materials that will not burn.
<b>Reactivity (yellow)</b>		
4		Materials which in themselves are readily capable of detonation or explosive decomposition or reaction at normal temperatures and pressures.
3		Materials which in themselves are capable of detonation or explosive reaction but require a strong initiating source or which must be heated under confinement before initiation or which react explosively with water.
2		Materials which in themselves are normally unstable and readily undergo violent chemical change but do not detonate. Also materials which may react violently with water or which may form potentially explosive mixtures with water.
1		Materials which in themselves are normally stable, but which can become unstable at elevated temperatures and pressures or which may react with water with some release of energy but not violently.
0		Materials which in themselves are normally stable, even under fire exposure conditions, and which are not reactive with water.
<b>Other (white)</b>		
W		Materials which react so violently with water that a possible hazard results when they come in contact with water, as in a fire situation. Similar to Reactivity Classification 2.
Oxy		Oxidizing material; any solid or liquid that readily yields oxygen or other oxidizing gas, or that readily reacts to oxidize combustible materials.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**9.1 Physical State at 15°C and 1 atm** - The statement indicates whether the chemical is a solid, liquid, or gas after it has reached equilibrium with its surroundings at “ordinary” conditions of temperature and pressure.

**9.2 Molecular Weight** - The value given is the weight of a molecule of the chemical relative to a value of 12 for one atom of carbon.

The molecular weight is useful in converting from molecular units to weight units and in calculating the pressure, volume and temperature relationships for gaseous materials. The ratio of the densities of any two gases is approximately equal to the ratio of their molecular weights (see 9.10).

The molecular weights of mixtures can be calculated if both the identity and quantity of each component of the mixture are known. Because the composition of mixtures described in this manual is not known exactly, or because it varies from one shipment to another, no molecular weights are given for such mixtures.

**9.3 Boiling Point at 1 atm** - The value is the temperature of a liquid when its vapor pressure is 1 atm. For example, when water is heated to 100°C (212°F) its vapor pressure rises to 1 atm and the liquid boils.

The boiling point at 1 atm indicates whether a liquid will boil and become a gas at any particular temperature and sea-level atmospheric pressure.

**9.4 Freezing Point** - The freezing point is the temperature at which a liquid changes to a solid. For example, liquid water changes to solid ice at 0°C (32°F). Some liquids solidify very slowly even when cooled below their freezing point. When liquids are not pure (for example, salt water) their freezing points are lowered slightly.

**9.5 Critical Temperature** - The maximum temperature at which a liquid can exist, no matter what the pressure on it, is called the critical temperature. For example, the critical temperature of water is 372°C (705°F). The value can be used to estimate many properties whose values are not immediately available.

**9.6 Critical Pressure** - The vapor pressure of a chemical at the critical temperature (see 9.5) is called the critical pressure. For example, the critical pressure of water is 218 atm. Values are given in pounds per square inch absolute, atmospheres, and meganewtons per square meter. The value can be used for estimating many property values that are not immediately available.

**9.7 Specific Gravity** - The specific gravity of a chemical is the ratio of the weight of the solid or liquid to the weight of an equal volume of water at 4°C (or at some other specified temperature).



If the specific gravity is less than 1.0 (or less than 1.03 in seawater) the chemical will float; if higher, it will sink. Where the change in the value with temperature is important, more data are found in 9.20.

**9.8 Liquid Surface Tension** - This property is a measure of the tensile force at the surface of a liquid that tends to shape liquid fragments into spherical drops. Values are expressed in dynes per centimeter and newtons per meter. Liquids with high surface tensions show less tendency to spread. Water has a surface tension of about 73 dynes/cm; seawater has a slightly higher value.

**9.9 Liquid-Water Interfacial Tension** - The value is a measure of the tensile forces existing at the interface between a liquid and water. Approximately, it is the difference between the individual surface tension of the liquid and that of water. Low values of the interfacial tension indicate that the chemical spreads readily on a water surface. The units are the same as in 9.8.

**9.10 Vapor (Gas) Specific Gravity** - The value is the ratio of the weight of vapor to the weight of an equal volume of dry air at the same conditions of temperature and pressure. Buoyant vapors have a vapor specific gravity less than one. The value may be approximated by the ratio  $M/29$ , where  $M$  is the molecular weight of the chemical (see 9.2).

In some cases the vapor may be at a temperature different from that of the surrounding air. For example, the vapor from a container of boiling methane at  $-172^{\circ}\text{F}$  sinks in warm air, even though the vapor specific gravity of methane at  $60^{\circ}\text{F}$  is about 0.6.

For the effect of temperature on vapor density, see 9.26.

**9.11 Ratio of Specific Heats of Vapor (Gas)** - This property is the ratio of the specific heat at constant pressure ( $C_p$ ) to the specific heat at constant volume ( $C_v$ ); its value is always greater than one. In most cases it was calculated by use of the expression:

$$\frac{C_p}{C_v} = \frac{C_p}{(C_p - R)}$$

where  $R$  is the Universal Gas Constant.

The ratio varies slightly with temperature; the value given is at  $20^{\circ}\text{C}$  ( $68^{\circ}\text{F}$ ). The ratio is often of value in estimating temperature changes when gases are compressed or expanded. Higher values of the ratio lead to larger temperature changes for a given pressure change.

**9.12 Latent Heat of Vaporization** - The value is the heat that must be added to the specified weight of a liquid before it can change to vapor (gas). It varies with temperature; the value given is that at the boiling point at 1 atm (see 9.3). The units used are Btu per pound, calories per gram, and joules per kilogram.

No value is given for chemicals with very high boiling points at 1 atm, because such substances are considered essentially nonvolatile.

**9.13 Heat of Combustion** - The value is the amount of heat liberated when the specified weight is burned in oxygen at 25°C. The products of combustion, including water, are assumed to remain as gases; the value given is usually referred to as the “lower heat value.” The negative sign before the value indicates that heat is given off when the chemical burns. Units are the same as in 9.12.

**9.14 Heat of Decomposition** - The value is the amount of heat liberated when the specified weight decomposes to more stable substances. The value is given for very few chemicals, because most are stable and do not decompose under the conditions of temperature and pressure encountered during shipment. The negative sign before the value simply indicates that heat is given off during the decomposition. The value does not include heat given off when the chemical burns. Units are the same as in 9.12.

**9.15 Heat of Solution** - The value represents the heat liberated when the specified weight of chemical is dissolved in a relatively large amount of water at 25°C (“infinite dilution”). A negative sign before the value indicates that heat is given off, causing a rise in temperature. (A few chemicals absorb heat when they dissolve, causing the temperature to fall.) Units are the same as in 9.12.

In those few cases where the chemical reacts with water and the reaction products dissolve, the heat given off during the reaction is included in the heat of solution.

**9.16 Heat of Polymerization** - The value is the heat liberated when the specified weight of the compound (usually called the monomer) polymerizes to form the polymer. In some cases the heat liberated is so great that the temperature rises significantly, and the material may burst its container or catch fire. The negative sign before the value indicates that heat is given off during the polymerization reaction. Units are the same as in 9.12.

**9.17 Heat of Fusion** - The value is the number of Btu needed to change one pound of solid to liquid with no change in temperature.

**9.18 Limiting Value** - A chemical specific concentration in water in mole fraction units below which the contribution to the evolution of toxic or flammable vapor at the water surface can be assumed to be negligible.

**9.19 Reid Vapor Pressure** - The value is the equilibrium pressure exerted by vapor over the liquid at 100°F., expressed as pounds per square inch absolute, as defined in 46 CFR 30.10-59.

Items 9.20 through 12.27 consist of tables. The temperature is given in one column followed by the appropriate data value in the next column.

**9.20 Saturated Liquid Density** - The value is the weight (in pounds) of one cubic foot of liquid that is in equilibrium with its vapor. Liquid densities decrease slightly with an increase in temperature; where literature data or reliable estimation methods were applicable, a table shows this effect.

**9.21 Liquid Heat Capacity** - The value is the heat (in Btu) required to raise the temperature of one pound of the liquid one degree Fahrenheit at constant pressure. For example, it requires almost 1 Btu to raise the temperature of 1 pound of water from 68°F to 69°F. The value is useful in calculating the increase in temperature of a liquid when it is heated, as in a fire. The value increases slightly with an increase in temperature; the table shows this effect.

**9.22 Liquid Thermal Conductivity** - The value is a measure of the ability of a liquid to conduct heat. It represents the number of Btu per hour that pass through an area of liquid one square foot in cross-section when the temperature gradient is 1°F per inch of depth. Higher values indicate that the liquid conducts heat more readily.

Liquid thermal conductivities decrease slightly with an increase in temperature. Where applicable, the table shows this effect.

A basic law of heat conduction states that the energy flow per unit area per unit time is proportional to the gradient in temperature. The constant of proportionality is the liquid thermal conductivity.

**9.23 Liquid Viscosity** - The value (in centipoise) is a measure of the ability of a liquid to flow through a pipe or hole; higher values indicate that the liquid flows less readily under a fixed pressure head. For example, heavy oils have higher viscosities (i.e., are more viscous) than gasoline.

Liquid viscosities decrease rapidly with an increase in temperature. In some cases a table is given to show the effect. In other cases only a single data point was found in the literature.

A basic law of fluid mechanics states that, for most fluids, the force per unit area needed to shear a fluid is proportional to the velocity gradient. The constant of proportionality is the viscosity.

**9.24 Solubility in Water** - The value represents the pounds of a chemical that will dissolve in 100 pounds of pure water. Solubility usually increases when the temperature increases; where the change has been measured, a table is given to show the effect. The following terms are used when numerical data are either unavailable or not applicable:

The term "Miscible" means that the chemical mixes with water in all proportions. The term "Reacts" means that the substance reacts chemically with water; thus, its solubility has no real meaning. "Insoluble" usually means that very little of the chemical dissolves in 100 pounds of water. (Weak solutions of "Insoluble" materials may still be hazardous to humans, fish, and waterfowl, however.)

**9.25 Saturated Vapor Pressure** - The value is the pressure (in pounds per square inch absolute) of the vapor in equilibrium with the liquid form at the specified temperature. Vapor pressure values can be used to estimate the relative volatility of chemicals at a given temperature, and to calculate the pressure over a liquid that is shipped in a closed container.

The vapor pressure increases as temperature increases; a table is given to show this effect. Note that the vapor pressure scale is logarithmic.

**9.26 Saturated Vapor Density** - The value is the weight (in pounds) of one cubic foot of vapor that is in equilibrium with the liquid form.

If it is assumed that the vapor behaves as an ideal gas, the relation  $pM/RT$  holds, where  $p$  is the vapor pressure,  $M$  is the molecular weight,  $R$  is the gas constant, and  $T$  is the temperature (in absolute units).

Since the vapor pressure varies with temperature (see 9.25), the saturated vapor density also varies with temperature, as shown on the table.

**9.27 Ideal Gas Heat Capacity** - The value is the number of Btu needed to raise the temperature of one pound of gas by 1° Fahrenheit. The property can be used only when the pressure of the gas is less than about 10 atm. The ideal gas heat capacity is not a function of pressure (below about 10 atm), but it does increase with temperature, and a table is given to show the effect.

## **4. OTHER INFORMATION SYSTEMS**

### **4.1 CHEMICAL TRANSPORTATION EMERGENCY CENTER (CHEMTREC)**

The Manufacturing Chemists Association operates CHEMTREC 24 hours a day. By calling the appropriate toll-free number listed below, one can consult experts on chemicals and spill response.

Continental United States, Alaska,	
Hawaii, and Canada .....	800-424-9300
District of Columbia .....	202-483-7616

### **4.2 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)**

The NFPA's "Recommended System for the Identification of the Fire Hazards of Materials" (NFPA No. 704M) provides basic warning information to fire fighter in industrial plants and storage facilities. This system uses a diamond-shaped warning symbol. The top, left, and right boxes refer to flammability, health, and reactivity hazards respectively and contain a number from 0 to 4. The exact meaning of each number is explained in Section 3 (para 12.3) of this manual, and the applicable number for each chemical are listed in Section 11 under "NFPA Hazard Classifications." The bottom box is used for special hazards; the most common of these is a warning against the use of water, indicated by the symbol W.

### **4.3 INTERNATIONAL MARITIME ORGANIZATION (IMO)**

Foreign vessels using U.S. waterways generally utilize, in addition to U.S. requirements, an international labeling system developed by IMO. This system consists of 15 diamond-shaped labels. Each identifies a particular hazard by a descriptive picture, a word, and a distinctive color.

The number at the bottom of each diamond identifies the class to which IMO has assigned the chemical and is the same as the first digit in the IMO/UN numerical designation, one of the items given under "Chemical Designations" in Section 11 of this manual.

### **4.4 DEPARTMENT OF TRANSPORTATION (DOT)**

The "1996 North American Emergency Response Guidebook" was developed by DOT as a guide for initial actions to be taken when handling incidents involving hazardous materials. The guidebook identifies the most significant potential hazards and gives information and guidance for initial actions to be taken based upon the material involved. Information can be located in the guidebook based upon chemical name or DOT Identification Number.

#### **4.5 OHM-TADS (EPA)**

The Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) has been developed by the Environmental Protection Agency (EPA) to provide information on physical and chemical properties, hazards, pollution characteristics, and shipping information for over 1200 hazardous materials. OHM-TADS consists of a computerized data base which can be accessed from terminals at the 10 EPA Regional Offices, from EPA Headquarters in Washington, D.C., and from Coast Guard Marine Safety Offices. The System can provide either information on specifically requested properties for a material, or it can print all the information in its files for that material.

Some of the same information appears in both this manual and OHM-TADS, but each contains some information not found in the other.

#### **4.6 POISON CONTROL CENTERS**

Throughout the country, local Poison Control Centers are maintained at hospitals. These Centers can provide information on the chemical composition, appearance, and toxicity of common poisonous materials as well as information on the symptoms of exposure and on the emergency procedures recommended in the event of exposure. The information available at these centers deals mainly with common household materials.

Poison Control Centers are coordinated through the Department of Health and Human Services in Washington, D.C., but information should be requested through the local centers.

The telephone number of the local Poison Control Center can be found in a local telephone directory.

#### **4.7 ASSOCIATION OF AMERICAN RAILROADS (AAR)**

The AAR has developed emergency action guides for 134 various commodities. The guides are contained in a single binder and provide technical information as well as response guidance.

## 5. CONVERSION FACTORS

To Convert	To	Multiply by
<b>Length</b>		
inches	millimeters	25.4
inches	feet	0.0833
feet	inches	12*
feet	meters	0.3048
feet	yards	0.3333
feet	miles (U.S. statute)	0.0001894
yards	yards	3*
yards	miles (U.S. statute)	0.0005682
miles (U.S. statute)	feet	5280*
miles (U.S. statute)	yards	1760*
miles (U.S. statute)	meters	1609
miles (U.S. statute)	nautical miles	0.868
meters	feet	3.281
meters	yards	1.094
meters	miles (U.S. statute)	0.0006214
nautical miles	miles (U.S. statute)	1.152
<b>Area</b>		
square inches	square centimeters	6.452
square inches	square feet	0.006944
square feet	square inches	144*
square feet	square meters	0.09290
square meters	square feet	10.76
square miles	square yards	3,097,600*
square yards	square feet	9*
<b>Volume</b>		
cubic inches	cubic centimeters	16.39
cubic inches	cubic feet	0.0005787
cubic feet	cubic inches	1728*
cubic feet	cubic meters	0.02832
cubic feet	U.S. gallons	7.481
cubic meters	cubic feet	35.31
liters	quarts (U.S. liquid)	1.057
quarts (U.S. liquid)	liters	0.9463
U.S. gallons	barrels (petroleum)	0.02381
U.S. gallons	cubic feet	0.1337
U.S. gallons	Imperial gallons	0.8327
barrels (petroleum)	U.S. gallons	42*
Imperial gallons	U.S. gallons	1.201
milliliters	cubic centimeters	1*

\* Exact value

**Time**

seconds	minutes	0.01667
seconds	hours	0.0002778
seconds	days	0.00001157
minutes	seconds	60*
minutes	hours	0.01667
minutes	days	0.0006944
hours	seconds	3600*
hours	minutes	60*
hours	days	0.04167

**Mass or Weight**

pounds	kilograms	0.4536
pounds	short tons	0.0005*
pounds	long tons	0.0004464
pounds	metric tons	0.0004536
tons (short)	pounds	2000*
tons (metric)	pounds	2205
tons (long)	pounds	2240*
kilograms	pounds	2.205
tonnes (metric tons)	kilograms	1000*

**Energy**

calories	Btu	0.003968
calories	joules	4.187
Btu (British Thermal Units)	calories	252.0
Btu	joules	1055
joules	calories	0.2388
joules	Btu	0.0009479

**Velocity**

feet per second	meters per second	0.3048
feet per second	miles per hour	0.6818
feet per second	knots	0.5921
meters per second	feet per second	3.281
meters per second	miles per hour	2.237
miles per hour	meters per second	0.4470
miles per hour	feet per second	1.467
knots	meters per second	0.5148
knots	miles per hour	1.151
knots	feet per second	1.689

**Density**

pounds per cubic foot	grams per cubic centimeter	0.01602
grams per cubic centimeter	pounds per cubic foot	62.42
grams per cubic centimeter	kilograms per cubic meter	1000*
kilograms per cubic meter	grams per cubic centimeter	0.001*

\* Exact value



**Pressure**

pounds per square inch absolute (psia)	kilonewtons per square meter (kN/m <sup>2</sup> )	6.895
psia	atmospheres	0.0680
psia	inches of water	27.67
psia	millimeters of mercury (torr)	51.72
pounds per square inch gauge (psig)	psia	add 14.70
millimeters of mercury (torr)	psia	0.01934
millimeters of mercury (torr)	kN/m <sup>2</sup>	0.1333
inches of water	psia	0.03614
kilograms per square centimeter	millimeters of mercury (torr)	735.6
inches of water	kN/m <sup>2</sup>	0.2491
kilograms per square centimeter	atmospheres	0.9678
atmospheres	kN/m <sup>2</sup>	101.3
kilograms per square centimeter	psia	14.22
atmospheres	psia	14.70
bars	kN/m <sup>2</sup>	100*
kilonewtons per square meter	psia	0.1450
bars	atmospheres	0.9869
kilonewtons per square meter	atmospheres	0.009869
bars	kilograms per square centimeter	1.020

**Viscosity**

centipoises	pounds per foot per second	0.0006720
pounds per foot per second	centipoises	1488
centipoises	poises	0.01*
centipoises	newton seconds per square meter	0.001*
poises	grams per centimeter per second	1*
grams per centimeter per second	poises	1*
newton seconds per square meter	centipoises	1000*

**Thermal Conductivity**

Btu per hour per foot per °F	watts per meter-kelvin	1.731
Btu per hour per foot per °F	kilocalories per hour per meter per °C	1.488
watts per meter-kelvin	Btu per hour per foot per °F	0.5778
kilocalories per hour per meter per °C	watts per meter-kelvin	1.163
kilocalories per hour per meter per °C	Btu per hour per foot per °F	0.6720

**Heat Capacity**

Btu per pound per °F	calories per gram per °C	1*
Btu per pound per °F	joules per kilogram-kelvin	4187
joules per kilogram-kelvin	Btu per pound per °F	0.0002388
calories per gram per °C	Btu per pound per °F	1*

**Concentration (in water solution)**

parts per million (ppm)	milligrams per liter	1*
milligrams per liter	ppm	1*
milligrams per cubic meter	grams per cubic centimeter	1 X 10 <sup>-9</sup>
grams per cubic centimeter	milligrams per cubic meter	1 X 10 <sup>9</sup>
grams per cubic centimeter	pounds per cubic foot	62.42
pounds per cubic foot	grams per cubic centimeter	0.01602

\* Exact value

**Temperature**

degrees Kelvin ( $^{\circ}\text{K}$ )	degrees Rankine ( $^{\circ}\text{R}$ )	1.8*
degrees Rankine ( $^{\circ}\text{R}$ )	degrees Kelvin ( $^{\circ}\text{K}$ )	0.5556
degrees centigrade ( $^{\circ}\text{C}$ )	degrees Fahrenheit ( $^{\circ}\text{F}$ )	first multiply by 1.8, then add 32
degrees Fahrenheit ( $^{\circ}\text{F}$ )	degrees centigrade ( $^{\circ}\text{C}$ )	first subtract 32, then multiply by 0.5556
degrees centigrade ( $^{\circ}\text{C}$ )	degrees Kelvin ( $^{\circ}\text{K}$ )	add 273.2
degrees Fahrenheit ( $^{\circ}\text{F}$ )	degrees Rankine ( $^{\circ}\text{R}$ )	add 459.7

**Flow**

cubic feet per second	U.S. gallons per minute	448.9
U.S. gallons per minute	cubic feet per second	0.002228

**Universal Gas Constant (R)**

8.314 joules per gram mole-Kelvin  
1.987 calories per gram mole-Kelvin  
1.987 Btu per pound mole per  $^{\circ}\text{F}$   
10.73 psia-cubic feet per pound mole per  
 $^{\circ}\text{F}$   
82.057 atm-cubic centimeters per gram  
mole-Kelvin  
62.361 millimeters mercury liter per gram  
mole-Kelvin

\* Exact value

## **6. SELECTED PROPERTIES OF FRESH WATER, SEA WATER, ICE AND AIR**

The following properties are useful for engineering calculations described in the Hazard Assessment Handbook. The values for fresh water are those recorded for pure water. The values for the water of lakes and streams differ somewhat from those of pure water, but since no "standard" fresh water has ever been defined, the values for pure water must be used.

A "standard" sea water has been defined as one containing 35 grams of salts per kilogram of solution. The values for the water of tidal estuaries differ somewhat from those of "standard" sea water because the water has a salinity somewhere between those of fresh and sea waters.

The value for the density of air was derived from the ideal gas law; the air is assumed to be dry and at 1 atmosphere pressure.

### **6.1 FREEZING POINT**

Fresh Water	0°C	32°F
Sea Water	-1.91°C	28.6°F

### **6.2 LATENT HEAT OF FUSION OF ICE**

$$79.6 \text{ cal/g} = 143.3 \text{ Btu/lb}$$

### **6.3 DENSITY** (See Table 6.1)

### **6.4 VISCOSITY** (See Table 6.1)

### **6.5 HEAT CAPACITY** (See Table 6.1)

### **6.6 THERMAL CONDUCTIVITY** (See Table 6.1)

### **6.7 VAPOR PRESSURE** (See Table 6.1)

**TABLE 6.1**

DENSITY OF FRESH WATER		DENSITY OF SEA WATER		DENSITY OF ICE		DENSITY OF DRY AIR (1 atm.)	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	Pounds per cubic foot
32	62.410	30	64.250	-50	57.670	-10	0.088
40	62.418	40	64.200	-40	57.625	0	0.086
50	62.401	50	64.170	-30	57.600	10	0.085
60	62.358	60	64.100	-20	57.582	20	0.083
70	62.293	70	64.020	-10	57.541	30	0.081
80	62.208	80	63.950	0	57.105	40	0.079
90	62.105	90	63.800	10	57.490	50	0.078
100	61.986	100	63.700	20	57.455	60	0.076
110	61.852			30	57.410	70	0.075
120	61.704					80	0.074
						90	0.072
						100	0.071
						110	0.070
						120	0.068

VISCOSITY OF FRESH WATER		VISCOSITY OF SEA WATER		HEAT CAPACITY OF FRESH WATER		HEAT CAPACITY OF SEA WATER	
Temperature (degrees F)	Centipoise	Temperature (degrees F)	Centipoise	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit per pound-F
32	1.770	30	1.880	32	1.007	30	0.936
40	1.540	40	1.610	40	1.004	40	0.935
50	1.304	50	1.400	50	1.001	50	0.934
60	1.122	60	1.210	60	1.000	60	0.932
70	0.974	70	1.060	70	0.999	70	0.931
80	0.858	80	0.920	80	0.998	80	0.930
90	0.763	90	0.815	90	0.998	90	0.928
100	0.682	100	0.730	100	0.998	100	0.927
110	0.616			110	0.998		
120	0.558			120	0.998		

**TABLE 6.1 (Continued)**

HEAT CAPACITY OF ICE		THERMAL CONDUCTIVITY OF FRESH WATER		THERMAL CONDUCTIVITY OF SEA WATER		THERMAL CONDUCTIVITY OF ICE	
Temperature (degrees F)	British thermal units per pound-F	Temperature (degrees F)	British thermal unit-inch per hour square foot-F	Temperature (degrees F)	British thermal unit-inch per hour square foot-F	Temperature (degrees F)	British thermal unit-inch per hour square foot-F
-50	0.400	32	3.932	30	3.890	-50	18.754
-40	0.413	40	3.979	40	3.950	-40	18.347
-30	0.426	50	4.037	50	4.010	-30	17.939
-20	0.438	60	4.096	60	4.070	-20	17.531
-10	0.451	70	4.154	70	4.130	-10	17.123
0	0.464	80	4.212	80	4.190	0	16.715
10	0.476	90	4.271	90	4.250	10	16.308
20	0.489	100	4.329	100	4.310	20	15.900
30	0.502	110	4.387			30	15.492
		120	4.446				

SATURATED VAPOR PRESSURE OF FRESH WATER		SATURATED VAPOR PRESSURE OF SEA WATER		SATURATED VAPOR PRESSURE OF ICE	
Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per square inch
32	0.089	30	0.079	-50	0.001
40	0.122	40	0.115	-40	0.002
50	0.178	50	0.167	-30	0.003
60	0.256	60	0.242	-20	0.006
70	0.363	70	0.351	-10	0.011
80	0.507	80	0.509	0	0.019
90	0.698	90	0.700	10	0.031
100	0.950	100	0.950	20	0.051
				30	0.081

## 7. GUIDE TO COMPATIBILITY OF CHEMICALS

The Guide is based in part upon information provided to the Coast Guard by the National Academy of Sciences - U.S. Coast Guard Advisory Committee on Hazardous Materials and represents the latest information available to the Coast Guard on chemical compatibility.

The accidental mixing of one chemical cargo with another can in some cases be expected to result in a vigorous and hazardous chemical reaction. The generation of toxic gases, the heating, overflow, and rupture of cargo tanks, and fire and explosion are possible consequences of such reactions.

The purpose of the Compatibility Chart is to show chemical combinations believed to be dangerously reactive in the case of accidental mixing. It should be recognized, however, that the Chart provides a broad grouping of chemicals with an extensive variety of possible binary combinations. Although one group, generally speaking, can be considered dangerously reactive with another group where an "X" appears on the Chart, there may exist between the groups some combinations which would not dangerously react. The Chart should therefore not be used as an infallible guide. It is offered as an aid in the safe loading of bulk chemical cargoes, with the recommendation that proper safeguards be taken to avoid accidental mixing of binary mixtures for which an "X" appears on the Chart. Proper safeguards would include consideration of such factors as avoidance of the use of common cargo and vent lines and carriage in adjacent tanks having a common bulkhead.

The following procedure explains how the Guide should be used in determining compatibility information:

- (1) Determine the reactivity group of a particular product by referring to the alphabetical list in Table 7.1.
- (1) Enter the Chart with the reactivity group. Proceed across the page. An "X" indicates a reactivity group that forms an unsafe combination with the product in question.

For example, crotonaldehyde is listed in Table 7.1 as belonging in Group 19 (Aldehydes) and also has a notation, (2), which is explained in the footnotes to Table 7.1. The Compatibility Chart shows that chemicals in group 19 should be segregated from sulfuric and nitric acids, caustics, ammonia, and all types of amines (aliphatic, alkanol, and aromatic). Footnote (2), refers the user to Table 7.3 where exceptions to the Compatibility Chart are listed. Here, crotonaldehyde is listed as also being incompatible with Group 1, non-oxidizing acids.

It is recognized that there are wide variations in the reaction rates of individual chemicals within the broad groupings shown reactive by the Compatibility Chart. Some individual materials in one group will react violently with some of the materials in another group and cause great hazard; others will react slowly, or not at all. Accordingly, a useful addition to the Guide would be the identification of specific materials which might not follow the characteristic reactivities of the rest of the materials in its Group. A few such combinations are listed in Table 7.3; as other exceptions to the Chart become known, they will be listed in subsequent revisions of this manual.

**FIGURE 1 – COMPATIBILITY CHART**  
[X indicates incompatible groups]

**CARGO COMPATIBILITY**

CARGO GROUPS	REACTIVE GROUPS	1. NON-OXIDIZING MINERAL ACIDS	2. SULFURIC ACID	3. NITRIC ACID	4. ORGANIC ACIDS	5. CAUSTICS	6. AMMONIA	7. ALIPHATIC AMINES	8. ALKANOLAMINES	9. AROMATIC AMINES	10. AMIDES	11. ORGANIC ANHYDRIDES	12. ISOCYANATES	13. VINYL ACETATE	14. ACRYLATES	15. SUBSTITUTED ALLYLS	16. ALKYLENE OXIDES	17. EPICHLOROHYDRINS	18. KETONES	19. ALDEHYDES	20. ALCOHOLS, GLYCOLS	21. PHENOLS, CRESOLS	22. CAPROLACTAM SOLUTION	
1. NON-OXIDIZING MINERAL ACIDS			X			X	X	X	X	X	X	X	X	X			X	X						1
2. SULFURIC ACID		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	2
3. NITRIC ACID			X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	3
4. ORGANIC ACIDS			X			X	X	X	X				X				X	X						4
5. CAUSTICS		X	X	X	X							X	X				X	X		X	X	X	X	5
6. AMMONIA		X	X	X	X						X	X	X	X			X	X		X				6
7. ALIPHATIC AMINES		X	X	X	X							X	X	X	X	X	X	X	X	X	X	X	X	7
8. ALKANOLAMINES		X	X	X	X							X	X	X	X	X	X	X		X				8
9. AROMATIC AMINES		X	X	X								X	X							X				9
10. AMIDES		X	X	X			X						X									X		10
11. ORGANIC ANHYDRIDES		X	X	X		X	X	X	X	X														11
12. ISOCYANATES		X	X	X	X	X	X	X	X	X	X										X		X	12
13. VINYL ACETATE		X	X	X			X	X	X															13
14. ACRYLATES			X	X				X	X															14
15. SUBSTITUTED ALLYLS			X	X				X	X															15
16. ALKYLENE OXIDES		X	X	X	X	X	X	X	X															16
17. EPICHLOROHYDRIN		X	X	X	X	X	X	X	X															17
18. KETONES			X	X				X																18
19. ALDEHYDES			X	X		X	X	X	X	X														19
20. ALCOHOLS, GLYCOLS			X	X		X		X					X											20
21. PHENOLS, CRESOLS			X	X		X		X			X													21
22. CAPROLACTAM SOLUTION			X			X		X					X											22
30. OLEFINS			X	X																				30
31. PARAFFINS																								31
32. AROMATIC HYDROCARBONS				X																				32
33. MISCELLANEOUS HYDROCARBON MIXTURES				X																				33
34. ESTERS			X	X																				34
35. VINYL HALIDES				X																		X		35
36. HALOGENATED HYDROCARBONS																								36
37. NITRILES			X																					37
38. CARBON DISULFIDE								X	X															38
39. SULFOLANE																								39
40. GLYCOL ETHERS			X										X											40
41. ETHERS			X	X																				41
42. NITROCOMPOUNDS					X	X	X	X	X	X														42
43. MISCELLANEOUS WATER SOLUTIONS			X										X											43
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Acetaldehyde	19	AAD	
Acetic acid	<sup>2</sup> 4	AAC	
Acetic anhydride	11	ACA	
Acetone	<sup>2</sup> 18	ACT	
Acetone cyanohydrin	<sup>1,2</sup> 0	ACY	
Acetonitrile	37	ATN	
Acetophenone	18	ACP	
Acrolein	<sup>2</sup> 19	ARL	
Acrylamide solution	10	AAM	
Acrylic acid	<sup>2</sup> 4	ACR	
Acrylonitrile	<sup>2</sup> 15	CAN	
Acrylonitrile-Styrene copolymer dispersion in Polyether polyol	20	ALE	
Adiponitrile	37	AND	
Alachlor technical	33	ALH	
*Alcohols (C13+)	20	ALY	TDN/TTN/PDC/TFA
Alcoholic beverages	20		
*Alcohol polyethoxylates	20		APU/APV/APW (APK/APL)
Alcohol polyethoxylates, secondary	20		AEA/AEB
Alkanes (C6-C9)	31	ALK	HXS/HMX/OAX/NAX
n-Alkanes (C10+)	31		DCC/DOC/TRD/ALJ
iso- & cyclo-Alkanes (C10-C11)	31	AKI	
iso & cyclo-Alkanes (C12+)	31		
Alkane (C14-C17) sulfonic acid, sodium salt solution	34	AKA	
Alkanyl polyether (C9-C20)	41	AKP	
Alkenyl (C11+) amide	11	AKM	
Alkenylsuccinic anhydride	11	AAH	
Alkyl acrylate-Vinyl pyridine copolymer in Toluene	32	AAP	
Alkyl (C8+) amine, Alkenyl (C12+) acid ester mixture	34	AAA	
Alkyl (C3-C4) benzenes	32	AKC	PBY/BBE
Alkyl (C5-C8) benzenes	32	AKD	
*Alkyl (C9+) benzenes	32	AKB	DBZ/UDB/DDB/TRB /TDB
*Alkylbenzene, Alkylindane, Alkylindene mixture (each C12-C17)	32	AIH	
Alkylbenzenesulfonic acid	<sup>1,2</sup> 0	ABS	
Alkylbenzenesulfonic acid, sodium salt solutions	33	ABT	
Alkyldithiadiazole (C6-C24)	33	ADT	
Alkyl ester copolymer (C6-C18)	34	AES	
Alkyl (C7-C9) nitrates	<sup>2</sup> 34	AKN	ONE
Alkyl phenol sulfide (C8-C40)	<sup>34</sup>	AKS	
Alkyl phthalates	34		
Allyl alcohol	<sup>2</sup> 15	ALA	
Allyl chloride	15	ALC	
Aluminum chloride, Hydrochloric acid solution	0	AHS	
Aluminum sulfate solution	<sup>2</sup> 43	ASX	ALM
2-(2-Aminoethoxy)ethanol	8	AEX	



**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Aminoethyldiethanolamine, Aminoethylethanolamine solution	8		
Aminoethylethanolamine	8	AEE	
N-Aminoethylpiperazine	7	AEP	
2-Amino-2-hydroxymethyl-1,3-propanediol solution	43	AHL	
2-Amino-2-methyl-1-propanol	8	APR	
Ammonia, anhydrous	6	AMA	
Ammonia, aqueous, see Ammonium hydroxide	6		AMH
Ammonium bisulfite solution	<sup>2</sup> 43	ABX	ASU
*Ammonium hydrogen phosphate solution	0	AMI	
Ammonium hydroxide (28% or less ammonia)	6	AMH	
Ammonium nitrate solution	<sup>1</sup> 0	ANR	AMN
Ammonium nitrate, Urea solution (containing Ammonia)	6	UAS	
*Ammonium nitrate, Urea solution (not containing Ammonia)	43	ANU	UAT
*Ammonium polyphosphate solution	43	AMO	APP
Ammonium sulfate solution	43	AME	AMS
Ammonium sulfide solution	5	ASS	ASF
Ammonium thiocyanate, Ammonium thiosulfate solution	0	ACS	
Ammonium thiosulfate solution	43	ATV	ATF
Amyl acetate	34	AEC	IAT/AML/AAS/AYA
Amyl alcohol	20	AAI	IAA/AAN/ASE/APM
*Amylene, see Pentene	30	AMZ	PTX
*Amyl methyl keton, see Methyl amyl ketone	18	AMK	MAK
Aniline	9	ANL	
Animal and Fish oils, n.o.s.	34	AFN	
Animal and Fish acid oils and distillates, n.o.s.	34	AFA	
Anthracene oil (Coal tar fraction), see Coal tar	33	AHO	COR
Apple juice	43		
Aryl polyolefin (C11-C50)	30	AYF	
Asphalt	33	ASP	ACU
Asphalt blending stocks, roofers flux	33	ARF	
Asphalt blending stocks, straight run residue	33	ASR	
Aviation alkylates	33	AVA	GAV
Barium long chain alkaryl sulfonate (C11-C50)	34	BCA	
Barium long chain alkyl (C8-C14) phenate sulfide	34	BCH	
Behenyl alcohol	20		
Benzene	32	BNZ	
Benzene hydrocarbon mixtures (having 10% Benzene or more)	32	BHB	
Benzenesulfonyl chloride	<sup>1,2</sup> 0	BSC	
Benzene, Toluene, Xylene mixtures	32	BTX	
Benzene tricarboxylic acid, trioctyl ester	34		
Benzylacetate	34	BZE	
Benzyl alcohol	21	BAL	
Benzyl chloride	36	BCL	
Brake fluid base mixtures	20	BFX	
Butadiene	30	BDI	
Butadiene, Butylene mixtures (cont. Acetylenes)	30	BBM	
Butane	31	BMX	IBT/BUT

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Butene, see Butylene	30		IBL/BTN
Butene oligomer	30	BOL	
Butyl acetate	34	BAX	IBA/BCN/BTA/BYA
Butyl acrylate	14	BAR	BAI/BTC
Butyl alcohol	<sup>2</sup> 20		IAL/BAN/BAS/BAT
Butylamine	7	BTY	IAM/BAM/BTL/BUA
Butylbenzene	32	BBE	
Butyl benzyl phthalate	34	BPH	
Butyl butyrate	34	BBA	BUB/BIB
Butylene	30	BTN	IBL
Butylene glycol	<sup>2</sup> 20	BUG	
Butylene oxide	16	BTO	
Butyl ether	41	BTE	
Butyl formate	34		BFI/BFN
Butyl heptyl ketone	18	BHK	
Butyl methacrylate	14	BMH	BMI/BMN
Butyl methacrylate, Decyl methacrylate, Cetyl-Eicosyl methacrylate mixture	14	DER	
Butyl phenol, Formaldehyde resin in Xylene	32		
n-Butyl propionate	34	BPN	
Butyl stearate	34		
Butyl toluene	32	BUE	
Butyraldehyde	19	BAE	BAD/BTR/BFA
Butyric acid	4	BRA	IBR
gamma-Butyrolactone	<sup>1,2</sup> 0	BLA	
Calcium alkyl (C9) phenol sulfide, polyolefin phosphorosulfide mixture	34	CPX	
Calcium bromide solution, see Drilling brines	43		DRB
Calcium bromide, Zinc bromide solution, see Drilling brine (containing zinc salts)	43		DZB
Calcium carbonate slurry	34		
Calcium chloride solution	43	CCS	CLC
Calcium hydroxide slurry	5	COH	
Calcium hypochlorite solutions	5		CHZ/CHU/CHY
Calcium long chain alkaryl sulfonate (C11-C50)	34	CAY	
Calcium long chain alkyl phenate (C8-C40)	34	CAN	
Calcium long chain alkyl phenate sulfide (C8-C40)	34	CPI	
Calcium long chain alkyl salicylate (C13+)	34	CAK	
Calcium long chain alkyl phenolic amine (C8-C40)	7		
Calcium nitrate, Magnesium nitrate, Potassium chloride solution	34		
Calcium sulfonate, Calcium carbonate, Hydrocarbon solvent mixture	33		
Camphor oil	18	CPO	
Caprolactam solution	22	CLS	
Carbolic oil	21	CBO	
Carbon disulfide	38	CBB	
Carbon tetrachloride	36	CBT	
Cashew nut shell oil (untreated)	4	OCN	
Caustic potash solution	<sup>2</sup> 5	CPS	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Caustic soda solution	<sup>25</sup>	CSS	
Cetyl-Eicosyl methacrylate mixture	14	CEM	
Cetyl-Stearyl alcohol	20		
Chlorinated paraffins (C10-C13)	36	CLH	
Chlorinated paraffins (C14 - C17)	36		
Chlorine	<sup>10</sup>	CLX	
Chloroacetic acid solution	4	CHM	CHL/MCA
Chlorobenzene	36	CRB	
Chlorodifluoromethane	36	MCF	
Chloroform	36	CRF	
Chlorohydrins	17	CHD	
4-Chloro-2-methylphenoxyacetic acid, Dimethylamine salt solution	9	CDM	
*Chloronitrobenzene	42	CNO	
Chloropropionic acid	4	CPM	CLA/CLP
Chlorosulfonic acid	<sup>10</sup>	CSA	
Chlorotoluene	36	CHI	CTM/CTO/CRN
Choline chloride solutions	20	CCO	
Citric acid	4	CIS	CIT
Clay slurry, see also Kaolin clay slurry	43		
Coal tar	33	COR	OCT
Coal tar pitch	33	CTP	
Cobalt naphthenate in solvent naphtha	34	CNS	
Coconut oil, fatty acid	34	CFA	
Corn syrup	43	CSY	
Cottonseed oil, fatty acid	34	CFY	
Creosote	<sup>21</sup>	CCT	CCW/CWD
Cresols	21	CRS	CRL/CSL/CSO
Cresylate spent caustic solution	05	CSC	
Cresylic acid	21	CRY	
Cresylic acid, dephenolized	21	CAD	
Cresylic acid, sodium salt solution, see Cresylate spent caustic	05		CSC
Cresylic acid tar	21	CRX	
Crotonaldehyde	<sup>219</sup>	CTA	
Cumene (isopropyl benzene), see Propylbenzene	32	CUM	PBY
1,5,9-Cyclododecatriene	30	CYT	
Cycloheptane	31	CYE	
Cyclohexane	31	CHX	
Cyclohexanol	20	CHN	
Cyclohexanone	18	CCH	
Cyclohexanone, cyclohexanol mixture	<sup>218</sup>	CYX	
Cyclohexyl acetate	34	CYC	
Cyclohexylamine	07	CHA	
*1,3-Cyclopentadiene dimer	30	CPD	DPT
Cyclopentane	31	CYP	
Cyclopentene	30	CPE	
Cymene	32	CMP	
Decahydronaphthalene	33	DHN	
Decaldehyde	19		IDA/DAL

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
*Decane, see n-Alkanes (C10+)	31	DCC	ALJ
Decanoic acid	04	DCO	
Decene	30	DCE	
Decyl acetate	34	DYA	
Decyl acrylate	14	DAT	IAI/DAR
Decyl alcohol	<sup>2</sup> 20	DAX	ISA/DAN
Decylbenzene	32	DBZ	AKB
Decyloxytetrahydro-thiophene dioxide	<sup>2</sup> 0	DHT	
Dextrose solution	43	DTS	
Diacetone alcohol	<sup>2</sup> 20	DAA	
Dialkyl(C10 - C14) benzenes	32	DAB	
Dialkyl(C7 - C13) phthalates	34	DAH	DHP/DIE/DOP/DIF /DTP/DUP/DID/DIN /DIO/EHE
Dibutyl amine	7	DBA	
Dibutyl hydrogen phosphonate	34	DHD	
Dibutyl phthalate	34	DPA	
Dichlorobenzene	36	DBX	DBM/DBO/DBP
Dichlorodifluoromethane	36	DCF	
1,1-Dichloroethane	36	DCH	
2,2'-Dichloroethyl ether	41	DEE	
1,6-Dichlorohexane	36	DHX	
2,2'-Dichloroisopropyl ether	36	DCI	
Dichloromethane	36	DCM	
2,4-Dichlorophenol	21	DCP	
2,4-Dichlorophenoxyacetic acid, Diethanolamine salt solution	43	DDE	
2,4-Dichlorophenoxyacetic acid, Dimethylamine salt solution	<sup>1,2</sup> 0	DAD	DDA/DSX
2,4-Dichlorophenoxyacetic acid, Triisopropanolamine salt solution	<sup>2</sup> 43	DTI	
Dichloropropane	36	DPX	DPB/DPP/DPC/DPL
1,3-Dichloropropene	15	DPS	DPU/DPF
Dichloropropene, dichloropropane mixture	15	DMX	
2,2-Dichloropropionic acid	4	DCN	
*Dicyclopentadiene, see 1,3-Cyclopentadiene dimer	30	DPT	CPD
Diethanolamine	08	DEA	
Diethanolamine salt of 2,4-Dichlorophenoxyacetic acid solution	43	DDE	
Diethylamine	07	DEN	
Diethylaminoethanol, see Diethylethanolamine	08		DAE
2,6-Diethylaniline	09	DMN	
Diethylbenzene	32	DEB	
Diethylene glycol	<sup>2</sup> 40	DEG	
Diethylene glycol butyl ether, see Poly(2-8) alkalene glycol monoalkyl (C1-C6) ether	40	DME	PAG
Diethylene glycol butyl ether acetate, see Poly(2-8) alkylene glycol monoalkyl(C1-C6)	34	DEM	PAF
Diethylene glycol dibutyl ether	40	DIG	
Diethylene glycol diethyl ether	40		

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Diethylene glycol ethyl ether, see Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether	40	DGE	PAG
*Diethylene glycol ethyl ether acetate, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether acetates	34	DGA	PAF
Diethylene glycol n-hexyl ether, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether	40	DHE	PAG
*Diethylene glycol methyl ether, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether	40	DGM	PAG
Diethylene glycol methyl ether acetate, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether acetate	34	DGR	PAF
Diethylene glycol phenyl ether	40	DGP	
Diethylene glycol phthalate	34	DGL	
Diethylene glycol propyl ether, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether	40	DGO	PAG
Diethylenetriamine	<sup>2</sup> 7	DET	
Diethylenetriamine pentaacetic acid, pentasodium salt solution	43		
Diethylethanolamine	8	DAE	
Diethyl ether, see Ethyl ether	41		EET
Di-(2-ethylhexyl)adipate	34	DEH	
Di-(2-ethylhexyl)phosphoric acid	1	DEP	
*Di-(2-ethylhexyl)phthalate, see Dialkyl (C7-C13) phthalates	34	DIE	DIO/DOP/DAH
Diethyl phthalate	34	DPH	
Diethyl sulfate	34	DSU	
Diglycidyl ether of Bisphenol A	41	BDE	BPA
Diglycidyl ether of Bisphenol F	41	DGF	
Diheptyl phthalate	34	DHP	
Di-n-hexyl adipate	34	DHA	
Dihexyl phthalate	34		
1,4Dihydro-9,10-dihydroxy anthracene, disodium salt solution	5	DDH	
Diisobutylamine	7	DBU	
*Diisobutylcarbinol, see Nonyl alcohol	20	DBC	NNS
Diisobutylene	30	DBL	
Diisobutyl ketone	18	DIK	
Diisobutyl phthalate	34	DIT	
*Diisodecyl phthalate, see Dialkyl (C7-C13) phthalates	34	DID	DAH
Diisononyl adipate	34	DNY	
*Diisononyl phthalate, see Dialkyl (C7-C13) phthalates	34	DIN	DAH
Diisooctyl phthalate	34	DIO	
Diisopropanolamine	8	DIP	
Diisopropylamine	7	DIA	
Diisopropylbenzene	32	DIX	
Diisopropyl naphthalene	32	DII	
N,N-Dimethyl acetamide	10	DAC	
N,N-Dimethylacetamide solution	10	DLS	
Dimethyl adipate	34	DLA	
Dimethylamine	7	DMA	
Dimethylamine solution	7		DMG/DMY/DMC

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Dimethylamine salt of 4-Chloro-2-methylphenoxyacetic acid solution	9	CDM	
Dimethylamine salt of 2,4-dichlorophenoxyacetic acid solution	<sup>1,2</sup> 0	DAD	DDA/DSX
2,6-Dimethylaniline	9	DMM	
Dimethylcyclcsiloxane hydrolyzate	34		
N,N-Dimethylcyclohexylamine	7	DXM	
Dimethylethanolamine	8	DMB	
Dimethylformamide	10	DMF	
Dimethyl furan	41		
Dimethyl glutarate	34	DGT	
Dimethyl hydrogen phosphite	<sup>2</sup> 34	DPI	
Dimethyl naphthalene sulfonic acid, sodium salt solution	<sup>2</sup> 34	DNS	
Dimethyloctanoic acid	4	DMO	
Dimethyl phthalate	34	DTL	
Dimethylpolysiloxane	34	DMP	
2,2-Dimethylpropane-1,3-diol	20	DDI	
Dimethyl succinate	34	DSE	
Dinitrotoluene	42	DNM	DTT/DNL/DNU
*Dinonyl phthalate, see Dialkyl (C7-C13) phthalates	34	DIF	DAH
*Diocetyl phthalate, see Dialkyl (C7-C13) phthalates	34	DOP	DAH
1,4-Dioxane	41	DOX	
Dipentene	30	DPN	
Diphenyl	32	DIL	
Diphenylamines, alkylated	7	DAJ	
Diphenylaine, reaction product with 2,2,4-trimethylpentene	7	DAK	
Diphenyl, Diphenyl ether mixture	33	DDO	DTH
Diphenyl ether	41	DPE	
Diphenyl ether, Diphenyl phenyl ether mixture	41	DOB	
Diphenylmethane diisocyanate	12	DPM	
Diphenylol propane-Epichlorohydrin resins	<sup>1</sup> 0	DPR	
Di-n-propylamine	7	DNA	
Dipropylene glycol	40	DPG	
Dipropylene glycol butyl ether, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether	40	DBG	PAG
Dipropylene glycol dibenzoate	34	DGY	
Dipropylene glycol methyl ether, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether	40	DPY	PAG
Distillates: flashed feed stocks	33	DFF	
Distillates: straight run	33	DSR	
*Ditridecyl phthalate, see Dialkyl (C7-C13) phthalates	34	DTP	DAH
*Diundecyl phthalate, see Dialkyl (C7-C13) phthalates	34	DUP	DAH
Dodecane	31	DOC	PFN
Dodecanol	20	DDN	LAL
Dodecene	30	DOZ	DDC/DOD
2-Dodecenylsuccinic acid, dipotassium salt solution	34		DSP
*Dodecyl alcohol, see Dodecanol			DDN
Dodecylamine, tetradecylamine mixture	<sup>2</sup> 07	DTA	
Dodecylbenzene	32	DDB	AKB
Dodecylbenzenesulfonic acid	<sup>2</sup> 0	DSA	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Dodecyl diphenyl oxide disulfonate solution	43	DOS	
Dodecyl hydroxypropyl sulfide	<sup>2</sup> 0	DOH	
Dodecylmethacrylate	14	DDM	
Dodecyl, pentadecyl methacrylate mixtures	14	DDP	
Dodecyl phenol	21	DOL	
Dodecyl xylene	32	DXY	
Drilling brine (containing Calcium, Potassium or Sodium salts)	43		DRB
Drilling brine (containing Zinc salts)	43	DZB	
Drilling mud (low toxicity) (if flammable or combustible)	33		DRM
Drilling mud (low toxicity) (if non-flammable or non-combustible)	43		DRM
Epichlorohydrin	17	EPC	
Epoxy resin	18		
Ethane	31	ETH	
Ethanolamine	8	MEA	
*2-Ethoxyethanol, see Ethylene glycol monoalkyl ethers	40	EEO	EGC/EGE
2-Ethoxyethyl acetate	34	EEA	
*Ethoxylated alcohols, C11-C15, see the alcohol polyethoxylates	20		APU/APV/APW (EOD/ENP/EOP/EOT/ETD)
Ethoxy triglycol	40	ETG	
Ethyl acetate	34	ETA	
Ethyl acetoacetate	34	EAA	
Ethyl acrylate	14	EAC	
Ethyl alcohol	<sup>2</sup> 0	EAL	
Ethylamine	<sup>2</sup> 7	EAM	
Ethylamine solution	7	EAN	
Ethyl amyl ketone	18	EAK	ELK
Ethyl benzene	32	ETB	
Ethyl butanol	20	EBT	
N-Ethyl-n-butylamine	7	EBA	
Ethyl butyrate	34	EBR	
Ethyl chloride	36	ECL	
Ethyl cyclohexane	31	ECY	
N-Ethylcyclohexylamine	7	ECC	
Ethylene	30	ETL	
Ethylene carbonate	34		
Ethylene chlorohydrin	20	ECH	
Ethylene cyanohydrin	20	ETC	
Ethylenediamine	<sup>2</sup> 0	EDA	EMX
Ethylenediaminetetracetic acid, tetrasodium salt solution	43	EDS	
Ethylene dibromide	36	EDB	
Ethylene dichloride	<sup>2</sup> 36	EDC	
Ethylene glycol	<sup>2</sup> 0	EGL	
Ethylene glycol acetate	34	EGO	
Ethylene glycol butyl ether, see Ethylene glycol monoalkyl ethers	40	EGM	EGC
Ethylene glycol tert-butyl ether, see Ethylene glycol monoalkyl ethers	40		EGC

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Ethylene glycol butyl ether acetate	34	EMA	
Ethylene glycol diacetate	34	EGY	
Ethylene glycol dibutyl ether	40	EGB	
Ethylene glycol ethyl ether, see Ethylene glycol monoalkyl ethers	40	EGE	EGC/EEO
Ethylene glycol ethyl ether acetate, see 2-Ethoxyethyl acetate	34	EGA	EEA
Ethylene glycol hexyl ether	40	EGH	
Ethylene glycol isopropyl ether, see Ethylene glycol monoalkyl ethers	40	EGI	EGC
Ethylene glycol methyl butyl ether	40	EMB	
Ethylene glycol methyl ether, see Ethylene glycol monoalkyl ethers	40	EME	EGC
Ethylene glycol methyl ether acetate	34	EGT	
Ethylene glycol monoalkyl ethers	40	EGC	
Ethylene glycol phenyl ether	40	EPE	
Ethylene glycol phenyl ether, Diethylene glycol phenyl ether mixture	40	EDX	
Ethylene glycol propyl ether, see Ethylene glycol monoalkyl ethers	40	EGP	EGC
Ethylene oxide	<sup>1</sup> 0	EOX	
Ethylene oxide, Propylene oxide mixture	16	EPM	
Ethylene-Propylene copolymer	30		
Ethylene, Vinyl acetate copolymer emulsion	43		
Ethyl ether	41	EET	
Ethyl-3-ethoxypropionate	34	EEP	
*Ethylhexaldehyde, see Octyl aldehydes	19	EHA	OAL
2-Ethylhexanoic acid, see Octanoic acids	4	EHO	OAY
*2-Ethylhexanol, see Octanol	20	EHX	OCX
2-Ethylhexyl acrylate	14	EAI	
2-Ethylhexylamine	7	EHM	
Ethyl hexyl phthalate	34	EHE	
*Ethyl hexyl tallate	34	EHT	
2-Ethyl-1-(hydroxymethyl)propane-1,3-diol, C8-C10 ester	34	EHD	
Ethylidene norbornene	<sup>2</sup> 30	ENB	
Ethyl methacrylate	14	ETM	
2-Ethyl-6-methyl-N(1'-methyl-2-methoxyethyl)aniline	9	EEM	
o-Ethyl phenol	21	EPL	
Ethyl propionate	34	EPR	
2-Ethyl-3-propylacrolein	<sup>2</sup> 19	EPA	
Ethyl toluene	32	ETE	
*Fatty acids (saturated, C13+)	34	FAD	SRA
Ferric chloride solution	1	FCS	FCL
Ferric hydroxyethylethylenediaminetriacetic acid, trisodium salt solution	<sup>2</sup> 43	FHX	STA
Ferric nitrate, Nitric acid solution	3	FNN	
Fish solubles (water based fish meal extracts)	43	FSO	
Fluorosilicic acid	1	FSJ	
Formaldehyde, Methanol mixtures	<sup>2</sup> 19	MTM	
Formaldehyde solution	<sup>2</sup> 19	FMS	



**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Formamide	10	FAM	
Formic acid	<sup>2</sup> 4	FMA	
Fructose solution	43		
Fumaric adduct of Rosin, water dispersion	43	FAR	
Furfural	19	FFA	
Furfuryl alcohol	<sup>2</sup> 20	FAL	
Gas oil: cracked	33	GOC	
Gasoline blending stocks: alkylates	33	GAK	
Gasoline blending stocks: reformates	33	GRF	
Gasolines:			
Automotive (not over 4.23 grams lead per gal.)	33	GAT	
Aviation (not over 4.86 grams lead per gal.)	33	GAV	AVA
Casinghead (natural)	33	GCS	
Polymer	33	GPL	
Straight run	33	GSR	
Glucose solution	43		
Glutaraldehyde solution	19	GTA	
Glycerine	<sup>2</sup> 20	GCR	
Glycerine, Dioxanedimethanol mixture	20	GDM	
Glycerol monooleate	20	GMO	
Glycerol polyalkoxylate	34		
Glyceryl triacetate	34		
Glycidyl ester of C10 tridecylacetic acid, see Glycidyl ester of tridecyl acetic acid	34		GLT
Glycidyl ester of tridecylacetic acid	34	GLT	
Glycidyl ester of Versatic acid, see Glycidyl ester of tridecylacetic acid	34		
Glycine, sodium salt solution	7		
Glycol diacetate	34		
Glyoxal solutions	19	GOS	
Glyoxylic acid	4	GAC	
Heptane	31	HMX	HPI/HPT
n-Heptanoic acid	4	HEP	
Heptanol	20	HTX	HTN
Heptene	30	HPX	HTE
Heptyl acetate	34	HPE	
*Herbicide (C15-H22-NO2-Cl), see Metolachlor			MCO
Hexaethylene glycol, see Polyethylene glycol	40		
Hexamethylene glycol	20		
Hexamethylenediamine adipate solution	43	HAM	
Hexamethylenediamine solution	7	HMC	HMD
Hexamethylenetetramine	7	HMT	
Hexamethylenetetramine solutions	7	HTS	
Hexamethylenimine	7	HMI	
Hexane	<sup>2</sup> 31	HXS	IHA/HXA
Hexanoic acid	4	HXO	
Hexanol	20	HXN	
*Hexene	30	HEX	HXE/HXT/MPN/MTN
Hexyl acetate	34	HAE	HSA
Hexylene glycol	20	HXG	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Hydrochloric acid	1	HCL	
*Hydrofluorosilicic acid, see Fluorosilicic acid	1	HFS	FSJ
Hydrogen peroxide solutions	<sup>1</sup> 0		HPN/HPS/HPO
2-Hydroxyethyl acrylate	<sup>1,2</sup> 0	HAI	
N-(Hydroxyethyl)ethylenediaminetriacetic acid, trisodium salt solution	43	HET	
2-Hydroxy-4-(methylthio)butanoic acid	4	HBA	
Hydroxy terminated polybutadiene, see polybutadiene, hydroxyl terminated	20		
Isophorone	<sup>2</sup> 18	IPH	
Isophorone diamine	7	IPI	
Isophorone diisocyanate	12	IPD	
Isoprene	30	IPR	
Isopropylbenzene(cumene), see Propylbenzene	32	CUM	PBY/CUM
Jet Fuels:			
JP-4	33	JPF	
JP-5	33	JPV	
JP-8	33	JPE	
Kaolin clay slurry	43		
Kerosene	33	KRS	
Ketone residue	18		
Kraft black liquor	05		KPL
Kraft pulping liquors (Black, Green, or White)	05	KPL	
Lactic acid	<sup>2</sup> 0	LTA	
Lactonitrile solution	37	LNI	
Lard	34		
Latex (ammonia inhibited)	30	LTX	
Latex, liquid synthetic	43	LLS	LTX
Lauric acid	34	LRA	
Lauryl polyglucose (50% or less)	20	LAP	
Lecithin (soyabean)	34	LEC	
Lignin liquor	43		
Liquid Streptomyces solubles	43		
Long chain alkaryl polyether (C11-C20)	41	LCP	
Long chain alkaryl sulfonic acid (C16-C60)	<sup>2</sup> 0	LCS	
Long chain alkylphenate/Phenol sulfide mixture	21		
Long chain polyetheramine in alkyl (C2-C4) benzenes	7	LCE	
Magnesium chloride solution	<sup>1,2</sup> 0		
Magnesium hydroxide slurry	5		
Magnesium long chain alkaryl sulfonate (C11-C50)	34	MAS	
Magnesium long chain alkyl phenate sulfide (C8-C20)	34	MPS	
Magnesium long chain alkyl salicylate (C11+)	34	MLS	
*Magnesium nonyl phenol sulfide, see Magnesium long chain alkyl phenate sulfide (C8-C20)			MPS
Magnesium sulfonate, see Magnesium long chain sulfonate (C11-C50)	34	MSE	MAS
Maleic anhydride	11	MLA	
Mercaptobenzothiazol, sodium salt solution	05		SMB
Mesityl oxide	<sup>2</sup> 18	MSO	
Metam sodium solution	07	MSS	SMD

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Methacrylic acid	04	MAD	
Methacrylic resin in Ethylene dichloride	14	MRD	
Methacrylonitrile	15	MET	
Methane	31	MTH	
3-Methoxy-1-butanol	20		
3-Methoxybutyl acetate	34	MOA	
N-(2-Methoxy-1-methyl ethyl)-2-ethyl-6-methyl chloroacetanilide, see Metolachlor			
1-Methoxy-2-propyl acetate	34	MPO	
Methoxy triglycol	40	MTG	
Methyl acetate	34	MTT	
Methyl acetoacetate	34	MAE	
Methyl acetylene, propadiene mixture	30	MAP	
Methyl acrylate	14	MAM	
Methyl alcohol	<sup>2</sup> 20	MAL	
Methylamine solution	7	MSZ	
Methyl amyl acetate	34	MAC	
*Methyl amyl alcohol	20	MAA	MIC
Methyl amyl ketone	18	MAK	
Methyl bromide	36	MTB	
Methyl butenol	20	MBL	
Methyl butyl ketone	18	MBK	
Methyl tert-butyl ether	<sup>2</sup> 41	MBE	
Methylbutynol	20	MBY	
3-Methyl butyraldehyde	19		
Methyl butyrate	34	MBU	
Methyl chloride	36	MTC	
Methylcyclohexane	31	MCY	
Methylcyclopentadiene dimer	30	MCK	
Methyl diethanolamine	8	MDE	MAB
2-Methyl-6-ethyl aniline	9	MEN	
Methyl ethyl ketone	<sup>2</sup> 18	MEK	
2-Methyl-5-ethylpyridine	9	MEP	
Methyl formate	34	MFM	
N-Methylglucamine solution	43	MGC	
N-Methylglucamine solution (70% or less)	43	MGC	
Methyl heptyl ketone	18	MHK	
2-Methyl-2-hydroxy-3-butyne	20	MHB	
Methyl isoamyl ketone	18		MAK
Methyl isobutyl carbinol, see Methyl amyl alcohol	20	MIC	MAA
Methyl isobutyl ketone	<sup>2</sup> 18	MIK	
Methyl methacrylate	14	MMM	
3-Methyl-3-methoxybutanol	20		
3-Methyl-3-methoxybutyl acetate	34		
Methyl naphthalene	32	MNA	
Methylolureas	19	MUS	
2-Methyl pentane	31		IHA
2-Methyl-1-pentene, see Hexene	30	MPN	HEX
*4-Methyl-1-pentene, see Hexene	30	MTN	HEX
Methyl propyl ketone	18	MKE	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Methylpyridine	9		MPR/MPE/MPF
N-Methyl-2-pyrrolidone	<sup>2</sup> 9	MPY	
Methyl Salicylate	34	MES	
alpha-Methylstyrene	30	MSR	
Metolachlor	34	MCO	
Milk	43		
Mineral spirits	33	MNS	
Molasses	20		
Molasses residue	0		
Monochlorodifluoromethane	36	MCF	
Morpholine	<sup>2</sup> 7	MPL	
Motor fuel anti-knock compounds containing lead alkyls	<sup>1</sup> 0	MFA	
Myrcene	30	MRE	
Naphtha:			
Aromatic	33		
Coal tar solvent	33	NCT	
Cracking fraction	<sup>2</sup> 33		
Heavy	33		
Paraffinic	33		
Petroleum	33	PTN	
Solvent	33	NSV	
Stoddard Solvent	33	NSS	
Varnish Makers' and Painters'	33	NVM	
Naphthalene	32	NTM	
Naphthalene sulfonic acid-formaldehyde copolymer, sodium salt solution	0	NFS	
Naphthalene sulfonic acid, sodium salt solution	34	NSA	
Naphthenic acids	4	NTI	
Naphthenic acid, sodium salt solution	43	NTS	
Neodecanoic acid	4	NEA	
Nitrating acid	<sup>1</sup> 0	NIA	
Nitric acid (70% or less)	3	NCD	
Nitric acid (Greater than 70%)	<sup>1</sup> 0		NAC
Nitrobenzene	42	NTB	
o-Nitrochlorobenzene, see Chloronitrobenzene	42		CNO/CNP
Nitroethane	42	NTE	
o-Nitrophenol	<sup>1,2</sup> 0	NTP	NIP/NPH
Nitropropane	42	NPM	NPN/NPP
Nitropropane, Nitroethane mixture	42		NNM/NNL
Nitrotoluene	42	NIT	NIE/NTT/NTR
Nonane	31	NAX	NAN
Nonanoic acid	4	NNA	NAI/NIN
Nonanoic, Tridecanoic acid mixture	4	NAT	
*Nonene	30	NOO	NON/NNE
Nonyl acetate	34	NAE	
*Nonyl alcohol	<sup>2</sup> 0	NNS	NNI/NNN/DBC
Nonyl methacrylate	14	NMA	
Nonylphenol	21	NNP	
Nonyl phenol (ethoxylated)	40		NPE
Nonyl phenol poly(4-12)ethoxylates	40	NPE	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
*Nonyl phenol sulfide solution, see Alkyl phenol sulfide (C8-C40)			AKS/NPS
Noxious Liquid Substance, n.o.s. (NLS's)	0		
1-Octadecene	30		
Octadecenoamide	10	ODD	
Octane	31	OAX	IOO/OAN
*Octanoic acid	4	OAY	OAA/EHO
Octanol	<sup>2</sup> 20	OCX	IOA/OTA/EHX
Octene	30	OTX	OTE
n-Octyl acetate	34	OAF	OAE
*Octyl alcohol, see (Octanol)	<sup>2</sup> 20	OCX	IOA/OTA
*Octyl aldehyde	19	OAL	IOC/OLX/EHA
Octyl decyl adipate	34	ODA	
Octyl nitrate, see Alkyl (C7-C9) nitrates	<sup>2</sup> 34	ONE	AKN
Octyl phenol	21		
Octyl phthalate, see Dialkyl (C7-C13) phthalates	34		DAH
Oil, edible:			
Beechnut	34	OBN	VEO
*Castor	34	OCA	VEO
Cocoa butter	34	OCB	VEO
Coconut	<sup>2</sup> 34	OCC	VEO
Cod liver	34	OCL	AFN
*Corn	34	OCO	VEO
*Cottonseed	34	OCS	VEO
*Fish	<sup>2</sup> 34	OFF	AFN
Groundnut	34	OGN	VEO
Hazelnut	34	OHN	VEO
*Lard	34	OLD	AFN
Maize	34		VEO/OCO
Nutmeg butter	34	ONB	VEO
*Olive	34	OOL	VEO
*Palm	<sup>2</sup> 34	OPM	VEO
*Palm kernel	34	OPO	VEO
*Peanut	34	OPN	VEO
Poppy	34	OPY	VEO
Poppy seed	34		VEO
Raisin seed	34	ORA	VEO
*Rapeseed	34	ORP	VEO
*Rice bran	34	ORB	VEO
*Safflower	34	OSF	VEO
Salad	34	OSL	VEO
Sesame	34	OSS	VEO
*Soya bean	34	OSB	VEO
*Sunflower seed	34	OSN	VEO
*Tucum	34	OTC	VEO
*Vegetable	34	OVG	VEO
Walnut	34	OWN	VEO
Oil, fuel:			
No. 1	33	OON	
No. 1-D	33	OOD	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
No. 2	33	OTW	
No. 2-D	33	OTD	
No. 4	33	OFR	
No. 5	33	OFV	
No. 6	33	OSX	
Oil, misc:			
Aliphatic	33		
Animal	34	OMA	AFN
Aromatic	33		
Clarified	33	OCF	
Coal	33		
Coconut oil, fatty acid methyl ester	34	OCM	
Cotton seed oil, fatty acid	34	CFY	
Crude	33	OIL	
Diesel	33	ODS	
Gas, high pour	33		
Gas, low pour	33		
Gas, low sulfur	33		
Heartcut distillate	33		
Lanolin	34	OLL	AFN
Linseed	33	OLS	
Lubricating	33	OLB	
Mineral	33	OMN	
Mineral seal	33	OMS	
Motor	33	OMT	
*Neatsfoot	33	ONF	AFN
Oiticica	34	OOI	
Palm oil, fatty acid methyl ester	34	OPE	
Penetrating	33	OPT	
Perilla	34	OPR	
Pilchard	34	OPL	AFN
Pine	33	OPI	
Residual	33		
Road	33	ORD	
Rosin	33	ORN	
Seal	34		
Soapstock	34	OIS	
*Soybean (epoxidized)	34		EVO
*Sperm	33	OSP	AFN
Spindle	33	OSD	
Tall	34	OTL	
Tall, fatty acid	<sup>2</sup> 34	TOF	
Transformer	33	OTF	
Tung	34	OTG	
Turbine	33	OTB	
Wood	34		
Olefin/Alkyl ester copolymer (molecular weight 2000+)	34	OCP	
Olefin mixtures	30		OFX/OFY
alpha-Olefins (C6 - C18) mixtures	30	OAM	
Olefins (C13+)	30		

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Oleic acid	04	OLA	
Oleum	<sup>1,2</sup> 0	OLM	
Oleylamine	10	OLY	
Oxyalkylated alkyl phenol formaldehyde	33		
Palm kernel acid oil	34	PNO	
Palm kernel dacid oil, methyl ester	34	PNF	
*Palm kernel oil, fatty acid, see Palm kernel acid oil			
*Palm kernel oil, fatty acid methyl ester, see Palm kernel acid oil, methyl ester			
Palm stearin	34	PMS	
n-Paraffins (C10 - C20), see n-Alkanes (C10+)	31	PFN	
Paraldehyde	19	PDH	
Pentachloroethane	36	PCE	
Pentadecanol, see alcohols (C13+)	20	PDC	ALY
1,3-Pentadiene	30	PDE	PDN
Pentaethylenehexamine	7	PEN	
Pentaethylenehexamine, Tetraethylenepentamine mixture	7	PEP	
Pentane	31	PTY	IPT/PTA
Pentanoic acid	4	POC	
Pentene	30	PTX	PTE
Pentene, Miscellaneous hydrocarbon mixture	<sup>2</sup> 30		
Pentyl aldehyde	19		
n-Pentyl propionate	34	PPE	
Perchloroethylene	36	PER	
Petrolatum	33	PTL	
Phenol	21	PHN	
1-Phenyl-1-xylyl ethane	32	PXE	
Phosphoric acid	1	PAC	
Phosphorus	<sup>1</sup> 0		PPW/PPR/PPB
Phthalic anhydride (molten)	11	PAN	
Phthalate based polyester polyol	<sup>2</sup> 0	PBE	
alpha-Pinene	30	PIO	
beta-Pinene	30	PIP	
*Pinene	30	PIN	PIO/PIP
*Pine oil	33	PNL	OPI
Polyalkyl (C18 - C22) acrylate in Xylene	14	PIX	
Polyalkylene glycol butyl ether, see Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether	40	PGB	PAG
Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether	40	PAG	
Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether acetate	34	PAF	
Polyalkylene glycols, polyalkylene glycol monoalkyl ethers mixtures	40	PPX	
Polyalkylene oxide polyol	20	PAO	
Polyalkyl methacrylate (C1-C20)	14	PMT	
Polyaluminum chloride solution	1		
Polybutadiene, hydroxyl terminated	20		
Polybutene	30	PLB	
Polybutenyl succinimide	10	PBS	
Poly(2+)cyclic aromatics	32	PCA	
Polydimethylsiloxane	34		

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Polyether (molecular weight 2000+)	41	PYR	
Polyethylene glycol	40		
Polyethylene glycol dimethyl ether	40		
Polyethylene glycol monoalkyl ether, see Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether	40	PEE	PAG
Polyethylene polyamines	<sup>2</sup> 7	PEB	
Polyferric sulfate solution	34	PSS	
Polyglycerine, Sodium salts solution (containing less than 3% Sodium hydroxide)	<sup>2</sup> 20	PGT	
Polyglycerol	20		GCR
Poly(4+)isobutylene	30		
Polymethylene polyphenyl isocyanate	12	PPI	
Polymethylsiloxane	34		
Polyolefin (molecular weight 300+)	30		
Polyolefin amide alkeneamine (C28+)	7	POD	
Polyolefin amide alkeneamine borate (C28-C250)	34	PAB	
Polyolefin amide alkeneamine/Molybdenum oxysulfide mixture	7		
Polyolefin amide alkeneamine polyol	7	PAP	
Polyolefinamine in alkyl(C2-C4)benzenes	7	POF	
Polyolefin anhydride	11	PAR	
Polyolefin ester (C28-C250)	34	POS	
Polyolefin phenolic amine (C28-C250)	7	PPH	
Polyolefin phosphorosulfide, barium derivative (C28-C250)	34	PPS	
Poly(20)oxyethylene sorbitan monooleate	34	PSM	
Polypropylene	30	PLP	
Poly(5+)propylene	30	PLQ	
Polypropylene glycol	40	PGC	
Polypropylene glycol methyl ether	40	PGM	
*Polysiloxane	34		DMP
Potassium chloride solution	43	PCS	(DRB)
Potassium hydroxide solution	<sup>2</sup> 5		CPS
Potassium oleate	34	POE	
Potassium polysulfide, Potassium thiosulfide solution (41% or less)	0	PTG	
Potassium thiosulfate solution	43	PTF	
Propane	31	PRP	
Propanil, Mesityl oxide, Isophorone mixture	7	PMI	
Propanolamine	8	PAX	MPA/PLA
Propionaldehyde	19	PAD	
Propionic acid	4	PNA	
Propionic anhydride	11	PAH	
Propionitrile	37	PCN	
n-Propoxypropanol, see Propylene glycol monoalkyl ether	40	PXP	PGE
Propyl acetate	34		IAC/PAT
Propyl alcohol	<sup>2</sup> 20		IPA/PAL
Propyl amine	7		IPO/IPP/PRA
Propylbenzene	32	PBY	PBZ/CUM
n-Propyl chloride	36	PRC	
iso-Propylcyclohexane	31	IPX	



**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Propylene	30	PPL	
Propylene butylene polymer	30	PBP	
Propylene carbonate	34		
Propylene dimer	30	PDR	
Propylene glycol	<sup>2</sup> 20	PPG	
Propylene glycol n-butyl ether, see Propylene glycol monoalkyl ether	40	PGD	PGE
Propylene glycol ethyl ether, see Propylene glycol monoalkyl ether	40	PGY	PGE
Propylene glycol methyl ether, see Propylene glycol monoalkyl ether	40	PME	PGE
Propylene glycol methyl ether acetate	34	PGN	
Propylene glycol monoalkyl ether	40	PGE	PME/PGY
Propylene glycol propyl phenyl ether	40	PGP	
Propylene glycol propyl ether, see Propylene glycol monoalkyl ether	40		PGE
Propylene oxide	16	POX	
Propylene tetramer	30	PTT	
Propylene trimer	30	PTR	
Propyl ether	41		IPE/PRE
*Pseudocumene, see Trimethylbenzene	32		TME/TRE
Pyridine	9	PRD	
Pyridine bases	9	PRB	
Rosin oil	33	ORN	
Rosin soap (disproportionated) solution	43	RSP	
*Rum, see Alcoholic beverages	20		
Sewage sludge	43		
Silica slurry	43		
Sludge, treated	43		
Sodium acetate, Glycol, Water mixture (not containing Sodium hydroxide)	<sup>2</sup> 34	SAO	SAP
Sodium acetate, Glycol, Water mixture (containing Sodium hydroxide)	5	SAP	SAO
Sodium acetate solution	34	SAN	
Sodium alkyl sulfonate solution	43	SSU	
Sodium aluminate solution	5	SAU	
Sodium aluminosilicate slurry	34		
Sodium benzoate solution	34	SBN	
Sodium borohydride, sodium hydroxide solution	5	SBX	SBH/SBI
Sodium carbonate solutions	5	SCE	
Sodium chlorate solution	<sup>1,2</sup> 0	SDD	SDC
Sodium cyanide solution	5	SCS	SCN
Sodium dichromate solution	<sup>1,2</sup> 0	SDL	SCR
Sodium dimethyl naphthalene sulfonate solution	<sup>2</sup> 34		DNS
Sodium hydrogen sulfide, Sodium carbonate solution	<sup>2</sup> 0	SSS	
Sodium hydrogen sulfite solution	43	SHX	
Sodium hydrosulfide solution	<sup>2</sup> 5	SHR	
Sodium hydrosulfide, Ammonium sulfide solution	<sup>2</sup> 5	SSA	
Sodium hydroxide solution	<sup>2</sup> 5		CSS
Sodium hypochlorite solution	5	SHP	SHC

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Sodium long chain alkyl salicylate (C13+)	34	SLS	
Sodium 2-mercaptobenzothiazol solution	5	SMB	
Sodium naphthalene sulfonate solution	34	SNS	
Sodium naphthenate solution, see Naphthenic acid, sodium salt solution	5		
Sodium nitrite solution	5	SNI	SNT
Sodium petroleum sulfonate	33	SPS	
Sodium polyacrylate solution	<sup>2</sup> 43		
Sodium salt of Ferric hydroxyethylethylenediamine triacetic acid solution	43	STA	FHX
Sodium silicate solution	<sup>2</sup> 43	SSN	SSC
Sodium sulfide, hydrosulfide solution	<sup>1,2</sup> 0		SSH/SSI/SSJ
Sodium sulfide solution	43	SDR	
Sodium sulfite solution	43	SUP	SUS
Sodium tartrates, Sodium succinates solution	43	STM	
Sodium thiocyanate solution	<sup>1,2</sup> 0	STS	SCY
Sorbitol solutions	20		SBT
Soyabean oil (epoxidized)	34		OSC/EVO
Stearic acid, see Fatty acids (saturated, C13+)	34	SRA	FAD
Stearyl alcohol	20		
Styrene	30	STY	STX
Sulfolane	39	SFL	
Sulfohydrocarbon (C3-C88)	33	SFO	
Sulfohydrocarbon, long chain (C18+) alkylamine mixture	7	SFX	
Sulfonated polyacrylate solutions	<sup>2</sup> 43		
Sulfur	<sup>1</sup> 0	SXX	
Sulfuric acid	<sup>2</sup> 2	SFA	
Sulfuric acid, spent	2	SAC	
Tall oil	34	OTL	
Tall oil fatty acid, barium salt	<sup>2</sup> 0	TOB	
Tall oil soap (disproportionated) solution	43	TOS	
Tallow	<sup>2</sup> 34	TLO	
Tallow fatty acid	<sup>2</sup> 34	TFD	
Tallow fatty alcohol, see Alcohols (C13+)	20	TFA	ALY
Tallow nitrile	37	TAN	
1,1,2,2-Tetrachloroethane	36	TEC	
*Tetradecanol, see Alcohols (C13+)	20	TTN	ALY
*Tetradecene, see the olefins entries	30	TTD	
Tetradecylbenzene	32	TDB	AKB
Tetraethylene glycol	40	TTG	
Tetraethylenepentamine	7	TTP	
Tetrahydrofuran	41	THF	
Tetrahydronaphthalene	32	THN	
*1,2,3,5-Tetramethylbenzene, see Tetramethylbenzene	32	TTB	TTC
Tetramethylbenzene	32	TTC	TTB
Tetrapropylbenzene, see Alkyl(C9+)benzenes	32		AKB
Tetrasodium salt of EDTA solution	43		EDS
Titanium tetrachloride	2	TTT	
Toluene	32	TOL	
Toluenediamine	9	TDA	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Toluene diisocyanate	12	TDI	
o-Toluidine	9	TLI	
*Triarylphosphate, see Triisopropylated phenyl phosphates	34		TPL
Tributyl phosphate	34	TBP	
1,2,4-Trichlorobenzene	36	TCB	
1,1,1-Trichloroethane	<sup>2</sup> 36	TCE	
1,1,2-Trichloroethane	36	TCM	
Trichloroethylene	<sup>2</sup> 36	TCL	
1,2,3-Trichloropropane	36	TCN	
1,1,2-trichloro-1,2,2-trifluoroethane	36	TTF	
Tricresyl phosphate	34		TCO/TCP
*Tridecane, see n-Alkanes (C10+)	31	TRD	
Tridecanoic acid	34		
*Tridecanol, see Alcohols (C13+)	20	TDN	ALY
*Tridecene, see Olefins (C13+)	30	TDC	
Tridecyl acetate	34	TAE	
Tridecylbenzene	32	TRB	AKB
Triethanolamine	<sup>2</sup> 8	TEA	
Triethylamine	7	TEN	
Triethylbenzene	32	TEB	
Triethylene glycol	40	TEG	
Triethylene glycol butyl ether, see Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether	40		PAG
Triethylene glycol butyl ether mixture	40		
Triethylene glycol di-(2-ethylbutyrate)	34	TGD	
Triethylene glycol ether mixture	40		
Triethylene glycol ethyl ether, see Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether	40	TGE	PAG
Triethylene glycol methyl ether, see Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether	40	TGY	PAG
Triethylenetetramine	<sup>2</sup> 7	TET	
Triethyl phosphate	34	TPS	
Triethyl phosphite	<sup>2</sup> 34	TPI	
Trifluralin in Xylene	18	TFX	
Triisobutylene	30	TIB	
Triisooctyl trimellitate	34		
Triisopropanolamine	8	TIP	
Triisopropanolamine salt of 2,4-Dichlorophenoxyacetic acid solution	43		
Triisopropylated phenyl phosphates	34	TPL	
Trimethylacetic acid	4	TAA	
Trimethylamine solution	7	TMT	
Trimethylbenzene	32	TRE	TME/TMB/TMD
Trimethylhexamethylenediamine (2,2,4- and 2,4,4-)	7	THA	
Trimethylhexamethylene diisocyanate (2,2,4- and 2,4,4-)	12	THI	
Trimethylol propane polyethoxylate	20	TPR	
2,2,4-Trimethyl pentanediol-1,3-diisobutyrate, see 2,2,4-Trimethyl-1,3-pentanediol diisobutyrate			
2,2,4-Trimethyl-1,3-pentanediol diisobutyrate	34	TMQ	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
2,2,4-Trimethyl-1,3-pentanediol-1-isobutyrate	34	TMP	
2,2,4-Trimethyl-3-pentanol-1-isobutyrate	34		
Trimethyl phosphite	<sup>2</sup> 34	TPP	
1,3,5-Trioxane	<sup>2</sup> 41	TRO	
Triphenylborane, Caustic soda solution	5	TPB	
*Tripropylene, see Propylene trimer	30		PTR
Tripropylene glycol	40	TGC	
*Tripropylene glycol methyl ether, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether	40	TGM	PAG
Trisodium nitrilotriacetate	34		
Trisodium phosphate solution	5	TSP	
Trisilyl Phosphate, see Trixylenyl phosphate	34		TRP
Trixylenyl phosphate	34	TRP	
Turpentine	30	TPT	
Undecanoic acid	4	UDA	
Undecanol, see Undecyl alcohol	20		UND
Undecene	30	UDC	
Undecyl alcohol	20	UND	
Undecylbenzene	32	UDB	AKB
Urea, Ammonium mono- and di-hydrogen phosphate, Potassium chloride solution	0	UPX	
Urea, Ammonium nitrate solution (containing Ammonia)	6	UAS	
Urea, Ammonium nitrate solution (not containing Ammonia)	43	UAT	ANU
Urea, Ammonium phosphate solution	43	UAP	
Urea solution	43		URE
Valeraldehyde	19	VAK	IVA/VAL
Vanillin black liquor	5	VLB	
Vegetable acid oils and distillates, n.o.s.	34	VAO	
Vegetable oils, n.o.s.	34	VEO	
Vegetable protein solution	43		
Vinyl acetate	13	VAM	
Vinyl chloride	35	VCM	
Vinyl ethyl ether	13	VEE	
Vinylidene chloride	35	VCI	
Vinyl neodecanoate	13	VND	
Vinyltoluene	13	VNT	
Water	43		
Waxes:		WAX	
Candelilla	34	WDC	
Carnauba	34	WCA	
Paraffin	31	WPF	
Petroleum	33		
White Spirit (low(15-20%) aromatic)	33	WSL	WSP
Xylene	32	XLX	XML/XLO/XLP
Xylenols	21	XYL	
Zinc alkaryl dithiophosphate (C7-C16)	34	ZAD	
Zinc alkenyl carboxamide	10	ZAA	
Zinc alkyl dithiophosphate (C3-C14)	34	ZAP	
Zinc bromide, Calcium bromide solution see Drilling brine	43		DZB

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

<b>Chemical Name</b>	<b>Group No.</b>	<b>CHRIS Code</b>	<b>Related CHRIS codes</b>
(containing Zinc salts			

**FOOTNOTES TO TABLE**

Items with an asterisk (\*) are changes per CGD 92-100.

<sup>1</sup> Because of very high reactivity or unusual conditions of carriage or potential compatibility problems, this product is not assigned to a specific group in the Compatibility Chart. For additional compatibility information, contact Commandant (G-MSO), U.S. Coast Guard, 2100 Second Street, SW., Washington, DC 20593-0001. Telephone (202) 267-1577.

<sup>2</sup> See Table 7.3 - Exceptions to the Chart.

**TABLE 7.2**  
**REACTIVITY GROUPS**

**0. UNASSIGNED CARGOES**

Acetone cyanohydrin<sup>1,2</sup>  
 Alkylbenzenesulfonic acid<sup>1,2</sup>  
 Aluminum chloride, Hydrochloric acid solution  
 Ammonium hydrogen phosphate solution<sup>1</sup>  
 Ammonium nitrate solution<sup>1</sup>  
 Ammonium thiocyanate, Ammonium thiosulfate solution<sup>1</sup>  
 Benzenesulfonyl chloride<sup>1,2</sup>  
 gamma-Butyrolactone<sup>1,2</sup>  
 Chlorine<sup>1</sup>  
 Chlorosulfonic acid<sup>1</sup>  
 Decyloxytetrahydro-thiophene dioxide<sup>2</sup>  
 2,4-Dichlorophenoxyacetic acid, Dimethylamine salt solution<sup>1,2</sup>  
 Dimethylamine salt of 2,4-dichlorophenoxyacetic acid solution<sup>1,2</sup>  
 Diphenylol propane-Epichlorohydrin resins<sup>1</sup>  
 Dodecylbenzenesulfonic acid<sup>1,2</sup>  
 Dodecylhydroxypropyl sulfide<sup>2</sup>  
 Ethylene oxide<sup>1</sup>  
 Fluorosilicic acid  
 2-Hydroxyethyl acrylate<sup>1,2</sup>  
 Lactic acid<sup>2</sup>  
 Long chain alkaryl sulfonic acid (C16-C60)<sup>2</sup>  
 Magnesium chloride solution<sup>1,2</sup>  
 Molasses residue<sup>1</sup>  
 Motor fuel anti-knock compounds containing lead alkyls<sup>1</sup>  
 Naphthalene sulfonic acid-formaldehyde copolymer, sodium salt solution<sup>1</sup>  
 Nitrating acid<sup>1</sup>  
 Nitric acid (Greater than 70%)<sup>1</sup>  
 o-Nitrophenol<sup>1,2</sup>  
 Noxious Liquid Substance, n.o.s. (NLS's)<sup>1</sup>  
 Oleum<sup>1,2</sup>  
 Phosphorus<sup>1</sup>  
 Phthalate based polyester polyol<sup>2</sup>  
 Potassium polysulfide, potassium thiosulfide solution (41% or less)  
 Sodium chlorate solution<sup>1,2</sup>  
 Sodium dichromate solution<sup>1,2</sup>  
 Sodium hydrogen sulfide, Sodium carbonate solution<sup>1,2</sup>  
 Sodium sulfide, hydrosulfide solution<sup>1,2</sup>  
 Sodium thiocyanate solution<sup>1,2</sup>  
 Sulfur<sup>1</sup>  
 Tall oil fatty acid, barium salt<sup>2</sup>

Urea, Ammonium mono- and di-hydrogen phosphate, Potassium chloride solution

**1. NON-OXIDIZING MINERAL ACIDS**

Di-(2-ethylhexyl)phosphoric acid  
 Ferric chloride solution  
 Fluorosilicic acid  
 Hydrochloric acid  
 Phosphoric acid  
 Polyaluminum chloride solution

**2. SULFURIC ACIDS**

Sulfuric acid<sup>2</sup>  
 Sulfuric acid, spent  
 Titanium tetrachloride

**3. NITRIC ACID**

Ferric nitrate, Nitric acid solution  
 Nitric acid (70% or less)

**4. ORGANIC ACIDS**

Acetic acid<sup>2</sup>  
 Acrylic acid<sup>2</sup>  
 Butyric acid  
 Cashew nut shell oil (untreated)  
 Chloroacetic acid solution  
 Chloropropionic acid  
 Citric acid  
 Decanoic acid  
 2,2-Dichloropropionic acid  
 2,2-Dimethyloctanoic acid  
 2-Ethylhexanoic acid  
 Formic acid<sup>2</sup>  
 Glyoxylic acid  
 n-Heptanoic acid  
 Hexanoic acid  
 2-Hydroxy-4-(methylthio)butanoic acid  
 Methacrylic acid  
 Naphthenic acids  
 Neodecanoic acid  
 Nonanoic acid  
 Nonanoic, tridecanoic acid mixture  
 Octanoic acid  
 Pentanoic acid  
 Propionic acid

Trimethylacetic acid  
Undecanoic acid

## 5. CAUSTICS

Ammonium sulfide solution  
Calcium hypochlorite solutions  
Caustic potash solution<sup>2</sup>  
Caustic soda solution<sup>2</sup>  
Cresylate spent caustic  
Cresylic acid, sodium salt solution  
Kraft black liquor  
Kraft pulping liquors  
Mercaptobenzothiazol, sodium salt solution  
Potassium hydroxide solution<sup>2</sup>  
Sodium acetate, glycol, water mixture  
(containing sodium hydroxide)  
Sodium aluminate solution  
Sodium borohydride, sodium hydroxide solution  
Sodium carbonate solutions  
Sodium cyanide solution  
Sodium hydrosulfide solution<sup>2</sup>  
Sodium hydrosulfide, Ammonium sulfide  
solution<sup>2</sup>  
Sodium hydroxide solution<sup>2</sup>  
Sodium hypochlorite solution  
Sodium 2-mercaptobenzothiazol solution  
Sodium naphthenate solution  
Sodium nitrite solution  
Triphenylborane, caustic soda solution  
Trisodium phosphate solution  
Vanillin black liquor

## 6. AMMONIA

Ammonia, anhydrous  
Ammonia, aqueous  
Ammonium hydroxide (28% or less ammonia)  
Ammonium nitrate-urea solution (containing  
ammonia)  
Urea, Ammonium nitrate solution (containing  
Ammonia)

## 7. ALIPHATIC AMINES

N-Aminoethyl piperazine  
Butylamine  
Calcium long chain alkyl phenolic amine (C8-  
C40)  
Cyclohexylamine  
Dibutyl amine  
Diethylamine<sup>2</sup>  
Diethylenetriamine  
Diisobutylamine  
Diisopropylamine  
Dimethylamine

Dimethylamine solution  
N,N-Dimethylcyclohexylamine  
Di-n-propylamine  
Diphenylamine, reaction product with 2,2,4-  
trimethylpentene  
Diphenylamines, alkylated  
Dodecylamine, tetradecylamine mixture<sup>2</sup>  
Dodecylmethylamine, tetradecyldimethylamine  
mixture  
Ethylamine<sup>2</sup>  
Ethylamine solution  
N-Ethyl-n-butylamine  
N-Ethylcyclohexylamine  
Ethylenediamine<sup>2</sup>  
2-Ethylhexylamine  
Hexamethylenediamine solution  
Hexamethylenetetramine  
Hexamethylenetetramine solutions  
Hexamethylenimine  
Isophorone diamine  
Long chain polyetheramine in alkyl (C2-C4)  
benzenes  
Metam sodium solution  
Methylamine solution  
Morpholine<sup>2</sup>  
Pentaethylenehexamine  
Pentaethylenehexamine,  
Tetraethylenepentamine mixture  
Polyalkyl methacrylate (C1-C20)  
Polyolefin amide alkeneamine (C28+)  
Polyolefin amide alkeneamine/Molybdenum  
oxysulfide mixture  
Polyethylene polyamines<sup>2</sup>  
Polyolefin amide alkeneamine polyol  
Polyolefinamine in alkyl (C2-C4) benzenes  
Polyolefin phenolic amine (C28-C250)  
Propanil, mesityl oxide, isophorone mixture  
Propyl amine  
Sulfohydrocarbon, long chain (C18+) alkylamine  
mixture  
Tetraethylenepentamine  
Triethylamine  
Triethylenetetramine<sup>2</sup>  
Trimethylamine solution  
Trimethylhexamethylenediamine (2,2,4- and  
2,4,4-)

## 8. ALKANOLAMINES

2-(2-Aminoethoxy)ethanol  
Aminoethyldiethanolamine,  
Aminoethylethanolamine solution  
Aminoethylethanolamine  
2-Amino-2-methyl-1-propanol  
Diethanolamine  
Diethylaminoethanol

Diethylethanolamine  
Diisopropanolamine  
Dimethylethanolamine  
Ethanolamine  
Propanolamine  
Triethanolamine<sup>2</sup>  
Triisopropanolamine

## 9. AROMATIC AMINES

Aniline  
4-Chloro-2-methylphenoxyacetic acid,  
Dimethylamine salt solution  
2,6-Diethylaniline  
Dimethylamine salt of 4-Chloro-2-  
methylphenoxyacetic acid solution  
2,6-Dimethylaniline  
2-Ethyl-6-methyl-N-(1'-methyl-2-  
methoxyethyl)aniline  
2-Methyl-6-ethyl aniline  
2-Methyl-5-ethyl pyridine  
Methylpyridine  
3-Methylpyridine  
N-Methyl pyrrolidone  
Pyridine  
Pyridine bases  
Toluenediamine  
p-Toluidine

## 10. AMIDES

Acrylamide solution  
Alkenyl (C11+) amide  
N,N-Dimethylacetamide  
N,N-Dimethylacetamide solution  
Dimethylformamide  
Formamide  
Octadecenoamide

## 11. ORGANIC ANHYDRIDES

Acetic anhydride  
Alkenylsuccinic anhydride  
Maleic anhydride  
Phthalic anhydride  
Polyolefin anhydride  
Propionic anhydride

## 12. ISOCYANATES

Diphenylmethane diisocyanate  
Isophorone diisocyanate  
Polymethylene polyphenyl isocyanate  
Toluene diisocyanate  
Trimethylhexamethylene diisocyanate (2,2,4-  
and 2,4,4-)

## 13. VINYL ACETATE

Vinyl acetate  
Vinyl ethyl ether  
Vinyl neodecanoate  
Vinyl toluene

## 14. ACRYLATES

Butyl acrylate  
Butyl methacrylate  
Butyl methacrylate, decyl methacrylate, cetyl  
eicosyl methacrylate mixture  
Cetyl eicosyl methacrylate mixture  
Decyl acrylate  
Dodecylmethacrylate  
Dodecyl, pentadecyl methacrylate mixture  
Ethyl acrylate  
2-Ethylhexyl acrylate  
Ethyl methacrylate  
Methacrylic resin in ethylene dichloride  
Methyl acrylate  
Methyl methacrylate  
Nonyl methacrylate  
Polyalkyl (C18 - C22) acrylate in Xylene  
Polyalkyl methacrylate (C1-C20)

## 15. SUBSTITUTED ALLYLS

Acrylonitrile<sup>2</sup>  
Allyl alcohol<sup>2</sup>  
Allyl chloride  
1,3-Dichloropropene  
Dichloropropene, dichloropropane mixture  
Methacrylonitrile

## 16. ALKYLENE OXIDES

Butylene oxide  
Ethylene oxide, Propylene oxide mixture  
Propylene oxide

## 17. EPICHLOROHYDRIN

Chlorohydrins  
Epichlorohydrin

## 18. KETONES

Acetone<sup>2</sup>  
Acetophenone  
Amyl methyl ketone  
Butyl heptyl ketone  
Camphor oil  
Cyclohexanone



Cyclohexanone, cyclohexanol mixture<sup>2</sup>  
 Diisobutyl ketone  
 Epoxy resin  
 Ethyl amyl ketone  
 Isophorone<sup>2</sup>  
 Ketone residue  
 Mesityl oxide<sup>2</sup>  
 Methyl amyl ketone  
 Methyl butyl ketone  
 Methyl diethenolamine  
 Methyl ethyl ketone<sup>2</sup>  
 Methyl heptyl ketone  
 Methyl isoamyl ketone  
 Methyl isobutyl ketone<sup>2</sup>  
 Methyl propyl ketone  
 Trifluralin in xylene

## 19. ALDEHYDES

Acetaldehyde  
 Acrolein<sup>2</sup>  
 Butyraldehyde  
 Crotonaldehyde<sup>2</sup>  
 Decaldehyde  
 Ethylhexaldehyde  
 2-Ethyl-3-propylacrolein<sup>2</sup>  
 Formaldehyde solution<sup>2</sup>  
 Formaldehyde, Methanol mixtures<sup>2</sup>  
 Furfural  
 Glutaraldehyde solution  
 Glyoxal solutions  
 3-Methyl butyraldehyde  
 Methylolureas  
 Octyl aldehyde  
 Paraldehyde  
 Pentyl aldehyde  
 Propionaldehyde  
 Valeraldehyde

## 20. ALCOHOLS, GLYCOLS

Acrylonitrile-Styrene copolymer dispersion in  
 Polyether polyol  
 Alcoholic beverages  
 Alcohol polyethoxylates  
 Alcohol polyethoxylates, secondary  
 Alcohols (C13 and above)  
 Amyl alcohol  
 Behenyl alcohol  
 Brake fluid base mixtures  
 Butyl alcohol<sup>2</sup>  
 Butylene glycol<sup>2</sup>  
 Cetyl-stearyl alcohol  
 Choline chloride solutions  
 Cyclohexanol  
 Decyl alcohol<sup>2</sup>

Diacetone alcohol<sup>2</sup>  
 Diisobutylcarbinol  
 2,2-Dimethylpropane-1,3-diol  
 Dodecanol  
 Dodecyl alcohol  
 Ethoxylated alcohols, C11-C15  
 2-Ethoxyethanol  
 Ethyl alcohol<sup>2</sup>  
 Ethyl butanol  
 Ethylene chlorohydrin  
 Ethylene cyanohydrin  
 Ethylene glycol<sup>2</sup>  
 2-Ethylhexanol  
 Furfuryl alcohol<sup>2</sup>  
 Glycerine<sup>2</sup>  
 Glycerine, dioxanedimethanol mixture  
 Glycerol monooleate  
 Heptanol  
 Hexamethylene glycol  
 Hexanol  
 Hexylene glycol  
 Hydroxy terminated polybutadiene  
 Lauryl polyglucose (50% or less)  
 3-Methoxy-1-butanol  
 Methyl alcohol<sup>2</sup>  
 Methyl amyl alcohol  
 Methyl butenol  
 Methylbutynol  
 2-Methyl-2-hydroxy-3-butyne  
 Methyl isobutyl carbinol  
 3-Methyl-3-methoxybutanol  
 Molasses  
 Nonyl alcohol<sup>2</sup>  
 Octanol<sup>2</sup>  
 Octyl alcohol<sup>2</sup>  
 Pentadecanol  
 Polyalkylene oxide polyol  
 Polybutadiene, hydroxyl terminated  
 Polyglycerol  
 Polyglycerine, sodium salts solution (containing  
 less than 3% sodium hydroxide)<sup>2</sup>  
 Propyl alcohol<sup>2</sup>  
 Propylene glycol<sup>2</sup>  
 Rum  
 Sorbitol solutions  
 Stearyl alcohol  
 Tallow fatty alcohol  
 Tetradecanol  
 Tridecanol  
 Trimethylol propane polyethoxylate  
 Undecanol  
 Undecyl alcohol

## 21. PHENOLS, CRESOLS

Benzyl alcohol

Carbolic oil  
 Creosote<sup>2</sup>  
 Cresols  
 Cresylic acid  
 Cresylic acid dephenolized  
 Cresylic acid, tar  
 2,4-Dichlorophenol  
 Dodecyl phenol  
 o-Ethyl phenol  
 Long chain alkylphenate/phenol sulfide mixture  
 Nonylphenol  
 Octyl phenol  
 Phenol  
 Xylenols

## 22. CAPROLACTAM SOLUTIONS

Caprolactam solution

## 23-29. UNASSIGNED

## 30. OLEFINS

Amylene  
 Aryl polyolefin (C11-C50)  
 Butadiene  
 Butadiene, Butylene mixtures (cont. Acetylenes)  
 Butene  
 Butene oligomer  
 Butylene  
 1,5,9-Cyclododecatriene  
 1,3-Cyclopentadiene dimer  
 Cyclopentene  
 Decene  
 Dicyclopentadiene  
 Diisobutylene  
 Dipentene  
 Dodecene  
 Ethylene  
 Ethylene-propylene copolymer  
 Ethylidene norbornene<sup>2</sup>  
 1-Heptene  
 Hexene  
 Isoprene  
 Latex (ammonia (1% or less) inhibited)  
 Methyl acetylene, propadiene mixture  
 Methylcyclopentadiene dimer  
 2-Methyl-1-pentene  
 4-Methyl-1-pentene  
 alpha-Methyl styrene  
 Myrcene  
 Nonene  
 1-Octadecene  
 Octene  
 Olefin mixtures  
 alpha-Olefins (C6 - C18) mixtures

alpha-Olefins (C13 and above)  
 1,3-Pentadiene  
 Pentene  
 Pentene, Miscellaneous hydrocarbon mixture<sup>2</sup>  
 alpha-Pinene  
 beta-Pinene  
 Polybutene  
 Poly(4+)isobutylene  
 Polyolefin (molecular weight 300+)  
 Polypropylene  
 Poly(5+)propylene  
 Propylene  
 Propylene butylene polymer  
 Propylene dimer  
 Propylene tetramer  
 Propylene trimer  
 Styrene  
 Tetradecene  
 Tridecene  
 Triisobutylene  
 Tripropylene  
 Turpentine  
 Undecene

## 31. PARAFFINS

Alkanes (C6-C9)  
 n-Alkanes (C10+)  
 iso- & cyclo- Alkanes (C10-C11)  
 iso- & cyclo- Alkanes (C12+)  
 Butane  
 Cycloheptane  
 Cyclohexane  
 Cyclopentane  
 Decane  
 Dodecane  
 Ethane  
 Ethyl cyclohexane  
 Heptane  
 Hexane<sup>2</sup>  
 Methane  
 Methylcyclohexane  
 2-Methyl pentane  
 Nonane  
 Octane  
 Pentane  
 Propane  
 iso-Propylcyclohexane  
 Tridecane  
 Waxes: Paraffin

## 32. AROMATIC HYDROCARBONS

Alkyl (C3-C4) benzenes  
 Alkyl (C5-C8) benzenes  
 Alkyl (C9+) benzenes

Alkyl acrylate-Vinyl pyridine copolymer in  
 Toluene  
 Alkylbenzene, alkylindane, alkylindene mixture  
 (each C12-C17)  
 Benzene  
 Benzene, Hydrocarbon mixture (10% benzene  
 or more)  
 Benzene, Toluene, Xylene mixture  
 Butylbenzene  
 Butyl phenol, Formaldehyde resin in Xylene  
 Butyl toluene  
 Cumene  
 Cymene  
 Decylbenzene  
 Dialkyl(C10 - C14) benzenes  
 Diethylbenzene  
 Diisopropylbenzene  
 Diisopropyl naphthalene  
 Diphenyl  
 Dodecylbenzene  
 Dodecylxylene  
 Ethyl benzene  
 Ethyl toluene  
 Isopropylbenzene  
 Methyl naphthalene  
 Naphthalene  
 1-Phenyl-1-xylyl ethane  
 Poly(2+)cyclic aromatics  
 Propylbenzene  
 Pseudocumene  
 Tetradecylbenzene  
 Tetrahydronaphthalene  
 1,2,3,5-Tetramethylbenzene  
 Toluene  
 Tridecylbenzene  
 Triethylbenzene  
 Trimethylbenzene  
 Undecylbenzene  
 Xylene

### 33. MISCELLANEOUS HYDROCARBON MIXTURES

Alachlor technical  
 Alkylbenzenesulfonic acid, sodium salt solutions  
 Alkyl dithiothiadiazole (C6-C24)  
 Asphalt blending stocks: roofers flux  
 Asphalt blending stocks: straight run residue  
 Aviation alkylates  
 Calcium sulfonate, Calcium carbonate,  
 Hydrocarbon solvent mixture  
 Coal tar  
 Coal tar pitch  
 Decahydronaphthalene  
 Diphenyl, Diphenyl ether  
 Distillates: flashed feed stocks

Distillates: straight run  
 Drilling mud (low toxicity) (if flammable or  
 combustible)  
 Gas oil: cracked  
 Gasoline blending stocks: alkylates  
 Gasoline blending stocks: reformates  
 Gasolines:  
 Automotive (not over 4.23 grams lead per  
 gal.)  
 Aviation (not over 4.86 grams lead per gal.)  
 Casinghead (natural)  
 Polymer  
 Straight run  
 Jet Fuels:  
 JP-4  
 JP-5  
 JP-8  
 Kerosene  
 Mineral spirits  
 Naphtha:  
 Coal tar solvent  
 Petroleum  
 Solvent  
 Stoddard solvent  
 Varnish Makers' and Painters'  
 Oil, fuel:  
 No. 1  
 No. 1-D  
 No. 2  
 No. 2-D  
 No. 4  
 No. 5  
 No. 6  
 Oil, misc:  
 Aliphatic  
 Aromatic  
 Clarified  
 Coal  
 Crude  
 Diesel  
 Gas, high pour  
 Heartcut distillate  
 Linseed  
 Lubricating  
 Mineral  
 Mineral seal  
 Motor  
 Neatsfoot  
 Penetrating  
 Pine  
 Rosin  
 Sperm  
 Spindle  
 Turbine  
 Residual  
 Road

Transformer  
 Oxyalkylated alkyl phenol formaldehyde  
 Petrolatum  
 Pine oil  
 Sodium petroleum sulfonate  
 Sulfohydrocarbon (C3-C88)  
 Waxes: Petroleum  
 White Spirit (low(15-20%) aromatic)

### 34. ESTERS

Alkane (C14-C17) sulfonic acid, sodium salt solution  
 Alkyl(C8+)amine, Alkenyl (C12+) acid ester mixture  
 Alkyl ester copolymer (C6-C18)  
 Alkyl (C7-C9) nitrates<sup>2</sup>  
 Alkyl phenol sulfide (C8-C40)  
 Amyl acetate  
 Animal and fish oils, n.o.s.  
 Animal and fish acid oils and distillates, n.o.s.  
 Barium long chain alkaryl sulfonate (C11-C50)  
 Barium long chain alkyl (C8-C14) phenate sulfide  
 Benzene tricarboxylic acid, trioctyl ester  
 Benzylacetate  
 Butyl acetate  
 Butyl benzyl phthalate  
 n-Butyl butyrate  
 Butyl formate  
 iso-Butyl isobutyrate  
 n-Butyl propionate  
 Calcium alkyl(C9)phenol sulfide, polyolefin phosphorosulfide mixture  
 Calcium long chain alkaryl sulfonate (C11-C50)  
 Calcium long chain alkyl phenate (C8-C40)  
 Calcium long chain alkyl phenate sulfide (C8-C40)  
 Calcium long chain alkyl salicylate (C13+)  
 Calcium nitrate, Magnesium nitrate, Potassium chloride solution  
 Cobalt naphthenate in solvent naphtha  
 Coconut oil, fatty acid  
 Cottonseed oil, fatty acid  
 Cyclohexyl acetate  
 Decyl acetate  
 Dialkyl(C7 - C13) phthalates  
 Dibutyl hydrogen phosphonate  
 Dibutyl phthalate  
 Diethylene glycol butyl ether acetate  
 Diethylene glycol ethyl ether acetate  
 Diethylene glycol methyl ether acetate  
 Diethylene glycol phthalate  
 Di-(2-ethylhexyl)adipate  
 Di-(2-ethylhexyl)phthalate  
 Diethyl phthalate

Diethyl sulfate  
 Diheptyl phthalate  
 Dihexyl phthalate  
 Di-n-hexyl adipate  
 Diisobutyl phthalate  
 Diisodecyl phthalate  
 Diisononyl adipate  
 Diisononyl phthalate  
 Diisooctyl phthalate  
 Dimethyl adipate  
 Dimethylcyclicsiloxane hydrolyzate  
 Dimethyl glutarate  
 Dimethyl hydrogen phosphite<sup>2</sup>  
 Dimethyl naphthalene sulfonic acid, sodium salt solution<sup>2</sup>  
 Dimethyl phthalate  
 Dimethylpolysiloxane  
 Dimethyl succinate  
 Dinonyl phthalate  
 Dioctyl phthalate  
 Dipropylene glycol dibenzoate  
 Ditridecyl phthalate  
 2-Dodecenylsuccinic acid, dipotassium salt solution  
 Diundecyl phthalate  
 2-Ethoxyethyl acetate  
 Ethyl acetate  
 Ethyl acetoacetate  
 Ethyl butyrate  
 Ethylene carbonate  
 Ethylene glycol acetate  
 Ethylene glycol butyl ether acetate  
 Ethylene glycol diacetate  
 Ethylene glycol ethyl ether acetate  
 Ethylene glycol methyl ether acetate  
 Ethyl-3-ethoxypropionate  
 Ethyl hexyl phthalate  
 Ethyl propionate  
 Fatty acids (saturated, C13+)  
 Glycerol polyalkoxylate  
 Glyceryl triacetate  
 Glycidyl ester of C10 trialkyl acetic acid  
 Glycidyl ester of tridecylacetic acid  
 Heptyl acetate  
 Hexyl acetate  
 Lauric acid  
 Lecithin (soyabean)  
 Magnesium long chain alkaryl sulfonate (C11-C50)  
 Magnesium long chain alkyl phenate sulfide (C8-C20)  
 Magnesium long chain alkyl salicylate (C11+)  
 3-Methoxybutyl acetate  
 1-Methoxy-2-propyl acetate  
 Methyl acetate  
 Methyl acetoacetate

Methyl amyl acetate  
 Methyl butyrate  
 Methyl formate  
 3-Methyl-3-methoxybutyl acetate  
 Methyl salicylate  
 Metolachlor  
 Naphthalene sulfonic acid, sodium salt solution  
 (40% or less)  
 Nonyl acetate  
 n-Octyl acetate  
 Octyl decyl adipate  
 Oil, edible:  
   Beechnut  
   Castor  
   Cocoa butter  
   Coconut<sup>2</sup>  
   Cod liver  
   Corn  
   Cottonseed  
   Fish<sup>2</sup>  
   Groundnut  
   Hazelnut  
   Lard  
   Lanolin  
   Nutmeg butter  
   Olive  
   Palm<sup>2</sup>  
   Palm kernel  
   Peanut  
   Poppy  
   Poppy seed  
   Raisin seed  
   Rapeseed  
   Rice bran  
   Safflower  
   Salad  
   Sesame  
   Soya bean  
   Sunflower  
   Sunflower seed  
   Tucum  
   Vegetable  
   Walnut  
 Oil, misc.:  
   Animal  
   Coconut oil, fatty acid methyl ester  
   Cotton seed oil, fatty acid  
   Lanolin  
   Palm kernel oil, fatty acid methyl ester  
   Palm oil, methyl ester  
   Pilchard  
   Perilla  
   Soapstock  
   Soyabean (epoxidized)  
   Tall  
   Tall, fatty acid<sup>2</sup>

Tung  
 Olefin/alkyl ester copolymer (molecular weight  
 2000+)  
 Oleic acid  
 Palm kernel acid oil  
 Palm kernel acid oil, methyl ester  
 Palm stearin  
 n-Pentyl propionate  
 Poly(2-8)alkylene glycol monoalkyl(C1-C6) ether  
 acetate  
 Polydimethylsiloxane  
 Polyferric sulfate solution  
 Polymethylsiloxane  
 Poly(20)oxyethylene sorbitan monooleate  
 Polysiloxane  
 Polyolefin amide alkeneamine borate (C28-  
 C250)  
 Polyolefin ester (C28-C250)  
 Polyolefin phosphorosulfide, barium derivative  
 (C28-C250)  
 Potassium oleate  
 Propyl acetate  
 Propylene carbonate  
 Propylene glycol methyl ether acetate  
 Sodium acetate, glycol, water mixture (not  
 containing sodium hydroxide)<sup>2</sup>  
 Sodium acetate solution  
 Sodium benzoate solution  
 Sodium dimethyl naphthalene sulfonate solution<sup>2</sup>  
 Sodium long chain alkyl salicylate (C13+)  
 Sodium naphthalene sulfonate solution  
 Soyabean oil (epoxidized)  
 Stearic acid  
 Tall oil  
 Tallow<sup>2</sup>  
 Tallow fatty acid<sup>2</sup>  
 Tributyl phosphate  
 Tricresyl phosphate  
 Tridecanoic acid  
 Tridecyl acetate  
 Triethylene glycol di-(2-ethylbutyrate)  
 Triethyl phosphate  
 Triethyl phosphite<sup>2</sup>  
 Triisooctyl trimellitate<sup>2</sup>  
 Triisopropylated phenyl phosphates  
 2,2,4-Trimethyl-1,3-pentanediol diisobutyrate  
 2,2,4-Trimethyl-1,3-pentanediol-1-isobutyrate  
 2,2,4-Trimethyl-3-pentanol-1-isobutyrate  
 Trimethyl phosphite<sup>2</sup>  
 Trisodium nitrilotriacetate  
 Trixylyl phosphate  
 Trixylenyl phosphate  
 Vegetable acid oils and distillates, n.o.s.  
 Vegetable oils, n.o.s.  
 Waxes: Carnauba  
 Zinc alkaryl dithiophosphate (C7-C16)

Zinc alkyl dithiophosphate (C3-C14)

### 35. VINYL HALIDES

Vinyl chloride  
Vinylidene chloride

### 36. HALOGENATED HYDROCARBONS

Benzyl chloride  
Carbon tetrachloride  
Chlorinated paraffins (C10 - C13)  
Chlorinated paraffins (C14 - C17)  
Chlorobenzene  
Chlorodifluoromethane  
Chloroform  
Chlorotoluene  
Dichlorobenzene  
Dichlorodifluoromethane  
1,1-Dichloroethane  
1,6-Dichlorohexane  
2,2'-Dichloroisopropyl ether  
Dichloromethane  
Dichloropropane  
Ethyl chloride  
Ethylene dibromide  
Ethylene dichloride<sup>2</sup>  
Methyl bromide  
Methyl chloride  
Monochlorodifluoromethane  
n-Propyl chloride  
Pentachloroethane  
Perchloroethylene  
1,1,2,2-Tetrachloroethane  
1,2,4-Trichlorobenzene  
1,1,1-Trichloroethane<sup>2</sup>  
1,1,2-Trichloroethane  
Trichloroethylene<sup>2</sup>  
1,2,3-Trichloropropane  
1,1,2-trichloro-1,2,2-trifluoroethane

### 37. NITRILES

Acetonitrile  
Adiponitrile  
Lactonitrile solution  
Propionitrile  
Tallow nitrile

### 38. CARBON DISULFIDE

Carbon disulfide

### 39. SULFOLANE

Sulfolane

### 40. GLYCOL ETHERS

Diethylene glycol<sup>2</sup>  
Diethylene glycol butyl ether  
Diethylene glycol dibutyl ether  
Diethylene glycol diethyl ether  
Diethylene glycol ethyl ether  
Diethylene glycol methyl ether  
Diethylene glycol n-hexyl ether  
Diethylene glycol phenyl ether  
Diethylene glycol propyl ether  
Dipropylene glycol  
Dipropylene glycol butyl ether  
Dipropylene glycol methyl ether  
Ethoxy triglycol  
Ethylene glycol hexyl ether  
Ethylene glycol methyl butyl ether  
Ethylene glycol monoalkyl ethers  
Ethylene glycol tert-butyl ether  
Ethylene glycol butyl ether  
Ethylene glycol dibutyl ether  
Ethylene glycol ethyl ether  
Ethylene glycol isopropyl ether  
Ethylene glycol methyl ether  
Ethylene glycol phenyl ether  
Ethylene glycol phenyl ether, Diethylene glycol phenyl ether mixture  
Ethylene glycol propyl ether  
Hexaethylene glycol  
Methoxy triglycol  
Nonyl phenol (ethoxylated)  
Nonyl phenol poly(4-12)ethoxylates  
Polyalkylene glycol butyl ether  
Polyalkylene glycols, Polyalkylene glycol monoalkyl ethers mixtures  
Polyethylene glycols  
Polyethylene glycol dimethyl ether  
Poly(2-8)alkylene glycol monoalkyl(C1-C6) ether  
Polyethylene glycol monoalkyl ether  
Polypropylene glycols  
Polypropylene glycol methyl ether  
n-Propoxypropanol  
Propylene glycol monoalkyl ether  
Propylene glycol ethyl ether  
Propylene glycol methyl ether  
Propylene glycol n-butyl ether  
Propylene glycol phenyl ether  
Propylene glycol propyl ether  
Tetraethylene glycol  
Triethylene glycol  
Triethylene glycol butyl ether  
Triethylene glycol butyl ether mixture  
Triethylene glycol ether mixture  
Triethylene glycol ethyl ether  
Triethylene glycol methyl ether

Tripropylene glycol  
Tripropylene glycol methyl ether

#### 41. ETHERS

Alkaryl polyether (C9-C20)  
Butyl ether  
2,2-Dichloroethyl ether  
Diethyl ether  
Diglycidyl ether of Bisphenol F  
Diglycidyl ether of bisphenol A  
Dimethyl furan  
1,4-Dioxane  
Diphenyl ether  
Diphenyl ether, Diphenyl phenyl ether mixture  
Ethyl ether  
Long chain alkaryl polyether (C11-C20)  
Methyl tert-butyl ether<sup>2</sup>  
Propyl ether  
Tetrahydrofuran  
1,3,5-Trioxane  
Polyether (molecular weight 2000+)

#### 42. NITROCOMPOUNDS

o-Chloronitrobenzene  
Dinitrotoluene  
Nitrobenzene  
Nitroethane  
Nitropropane  
Nitropropane, Nitroethane mixture  
Nitrotoluene

#### 43. MISCELLANEOUS WATER SOLUTIONS

Aluminum sulfate solution<sup>2</sup>  
2-Amino-2-hydroxymethyl-1,3-propanediol  
solution  
Ammonium bisulfite solution<sup>2</sup>  
Ammonium nitrate-urea solution (not containing  
ammonia)  
Ammonium polyphosphate solution  
Ammonium sulfate solution  
Ammonium thiosulfate solution  
Sulfonated polyacrylate solutions<sup>2</sup>  
Calcium bromide solution  
Calcium chloride solution  
Clay slurry  
Corn syrup  
Dextrose solution  
2,4-Dichlorophenoxyacetic acid, Diethanolamine  
salt solution  
2,4-Dichlorophenoxyacetic acid,  
Triisopropanolamine salt solution<sup>2</sup>  
Diethanolamine salt of 2,4-  
Dichlorophenoxyacetic acid solution

Diethylenetriamine pentaacetic acid,  
pentasodium salt solution  
Dodecyl diphenyl ether disulfonate solution  
Drilling brine (containing Calcium, Potassium or  
Sodium salts)  
Drilling brine (containing Zinc salts)  
Drilling mud (low toxicity) (if non-flammable or  
non-combustible)  
Ethylenediaminetetracetic acid, tetrasodium salt  
solution  
Ethylene, Vinyl acetate copolymer emulsion  
Ferric hydroxyethylethylenediaminetriacetic acid,  
trisodium salt solution<sup>2</sup>  
Fish solubles (water based fish meal extracts)  
Fructose solution  
Fumaric adduct of Rosin, water dispersion  
Hexamethylenediamine adipate solution  
N-(Hydroxyethyl)ethylenediaminetriacetic acid,  
trisodium salt solution  
Kaolin clay slurry  
Latex, liquid synthetic  
Lignin liquor  
Liquid streptomyces solubles  
N-Methylglucamine solution  
N-Methylglucamine solution (70% or less)  
Naphthenic acid, sodium salt solution  
Potassium chloride solution  
Potassium thiosulfate solution  
Rosin soap (disproportionated) solution  
Sewage sludge, treated  
Sodium alkyl sulfonate solution  
Sodium hydrogen sulfite solution  
Sodium polyacrylate solution<sup>2</sup>  
Sodium salt of Ferric  
hydroxyethylethylenediamine triacetic acid  
solution  
Sodium silicate solution<sup>2</sup>  
Sodium sulfide solution  
Sodium sulfite solution  
Sodium tartrates, Sodium succinates solution  
Sulfonated polyacrylate solutions<sup>2</sup>  
Tall oil soap (disproportionated) solution  
Tetrasodium salt of EDTA solution  
Triisopropanolamine salt of 2,4-  
Dichlorophenoxyacetic acid solution  
Urea, Ammonium nitrate solution (not containing  
Ammonia)  
Urea, Ammonium phosphate solution  
Urea solution  
Vegetable protein solution (hydrolysed)  
Water

## FOOTNOTES TO TABLE

<sup>1</sup> Because of very high reactivity or unusual conditions of carriage or potential compatibility problems, this product is not assigned to a specific group in the Compatibility Chart. For additional compatibility information, contact Commandant (G-MTH), U.S. Coast Guard, 2100 Second Street, SW., Washington, DC 20593-0001. Telephone (202) 267-1577.

<sup>2</sup> See Table 7.3 - Exceptions to the Chart.



**TABLE 7.3**  
**EXCEPTIONS TO THE CHART**

1. The binary combinations listed below have been tested as prescribed in Appendix III and found not to be dangerously reactive. These combinations are exceptions to the Compatibility Chart (Figure 1) and may be stowed in adjacent tanks.

Member of Reactive Group	Compatible with		
Acetone (18)	Diethylenetriamine (7)	Tetradecylamine mixture (7)	Butyl alcohol (20)
Acetone cyanohydrin (0)	Acetic acid (4)	Ethylenediamine (7)	tert-Butyl alcohol (20)
Acrylonitrile (15)	Triethanolamine (8)		Butylene glycol (20)
1,3-Butylene glycol (20)	Morpholine (7)		Creosote (21)
1,4-Butylene glycol (20)	Ethylamine (7)		Diethylene glycol (40)
	Triethanolamine (8)		Ethyl alcohol (20)
Gamma-Butyrolactone(0)	N-Methyl-2-pyrrolidone (9)		Ethylene glycol (20)
Caustic potash, 50% or less (5)	Isobutyl alcohol (20)		Ethyl hexanol (20)
	Ethyl alcohol (20)		Glycerine (20)
	Ethylene glycol (20)		Isononyl alcohol (20)
	Isopropyl alcohol (20)		Isophorone (18)
	Methyl alcohol (20)		Methyl butyl ketone (18)
	iso-Octyl alcohol (20)		Methyl isobutyl ketone (18)
Caustic soda, 50% or less (5)	Butyl alcohol (20)		Methyl ethyl ketone (18)
	tert-Butyl alcohol, Methanol mixtures		Propyl alcohol (20)
	Decyl alcohol (20)		Propylene glycol (20)
	Iso-Decyl alcohol	Oleum (0)	Hexane (31)
	Diacetone alcohol (20)		Dichloromethane (36)
	Diethylene glycol (40)		Perchloroethylene (36)
	Ethyl alcohol (40%, whiskey) (20)	1,2-Propylene glycol (20)	Diethylenetriamine (7)
	Ethylene glycol (20)		Polyethylene polyamines (7)
	Ethylene glycol, Diethylene glycol mixture (20)		Triethylenetetramine (7)
	Ethyl hexanol (Octyl alcohol) (20)	Sodium dichromate, 70% (0)	Methyl alcohol (20)
	Methyl alcohol (20)	Sodium hydrosulfide solution (5)	Iso-Propyl alcohol (20)
	Nonyl alcohol (20)	Sulfuric acid (2)	Coconut oil (34)
	iso-Nonyl alcohol (20)		Coconut oil acid (34)
	Propyl alcohol (20)		Palm oil (34)
	Propylene glycol (20)		Tallow (34)
	Sodium chlorate (0)	Sulfuric acid, 98% or less (2)	Choice white grease tallow (34)
	iso-Tridecanol (20)		
Dodecyl and	Tall oil, fatty acid (34)		

2. The binary combinations listed below have been determined to be dangerously reactive, based on either data obtained in the literature or on laboratory testing which has been carried out in accordance with procedures prescribed in Appendix III. These combinations are exceptions to the Compatibility Chart (Figure 1) and may not be stowed in adjacent tanks.

Acetone cyanohydrin (0) is not compatible with Groups 1-12, 16, 17 and 22.

Acrolein (19) is not compatible with Group 1, Non-Oxidizing Mineral Acids.

Acrylic acid (4) is not compatible with Group 9, Aromatic Amines.

Acrylonitrile (15) is not compatible with Group 5 (Caustics)

Alkylbenzenesulfonic acid (0) is not compatible with Groups 1-3, 5-9, 15, 16, 18, 19, 30, 34, 37, and strong oxidizers.

Allyl alcohol (15) is not compatible with Group 12, Isocyanates.

Alkyl (C7-C9) nitrates (34) is not compatible with Group 1, Non-oxidizing Mineral Acids.

Aluminum sulfate solution (43) is not compatible with Groups 5-11.

Ammonium bisulfite solution (43) is not compatible with Groups 1, 3, 4, and 5.

Benzenesulfonyl chloride (0) is not compatible with Groups 5-7, and 43.

1,4-Butylene glycol (20) is not compatible with Groups 1-9.

gamma-Butyrolactone (0) is not compatible with Groups 1-9.

Caustic soda solution, 50% or less (5) is not compatible with 1,4-Butylene glycol (20).

Crotonaldehyde (19) is not compatible with Group 1, Non-Oxidizing Mineral Acids.

Cyclohexanone, Cyclohexanol mixture (18) is not compatible with Group 12, Isocyanates.

2,4-Dichlorophenoxyacetic acid, Triisopropanolamine salt solution (43) is not compatible with Group 3, Nitric acid.

2,4-Dichlorophenoxyacetic acid, Dimethylamine salt solution (0) is not compatible with Groups 1-5, 11, 12, and 16.

Dimethyl hydrogen phosphite (34) is not compatible with Groups 1 and 4.

Dimethyl naphthalene sulfonic acid, sodium salt solution (34) is not compatible with Group 12, Formaldehyde, and strong oxidizing agents.

Dodecylbenzenesulfonic acid (0) is not compatible with oxidizing agents and Groups 1, 2, 3, 5, 6, 7, 8, 9, 15, 16, 18, 19, 30, 34, and 37.

Ethylenediamine (7) is not compatible with Ethylene dichloride (36).

Ethylene dichloride (36) is not compatible with Ethylenediamine (7).

Ethylidene norbornene (30) is not compatible with Groups 1-3 and 5-8.

2-Ethyl-3-propylacrolein (19) is not compatible with Group 1, Non-Oxidizing Mineral Acids.

Ferric hydroxyethylethylenediamine triacetic acid, Sodium salt solution (43) is not compatible with Group 3, Nitric acid.

Fish oil (34) is not compatible with Sulfuric acid (2).

Formaldehyde (over 50%) in Methyl alcohol (over 30%) (19) is not compatible with Group 12, Isocyanates.

Formic acid (4) is not compatible with Furfural alcohol (20).

Furfuryl alcohol (20) is not compatible with Group 1, Non-Oxidizing Mineral Acids and Formic acid (4).

2-Hydroxyethyl acrylate is not compatible with Groups 2, 3, 5-8 and 12.

Isophorone (18) is not compatible with Group 8, Alkanolamines.

Magnesium chloride solution (0) is not compatible with Groups 2, 3, 5, 6 and 12.

Mesityl oxide (18) is not compatible with Group 8, Alkanolamines.

Methacrylonitrile (15) is not compatible with Group 5 (Caustics).

Methyl tert-butyl ether (41) is not compatible with Group 1, Non-oxidizing Mineral Acids.

Naphtha, cracking fraction (33) is not compatible with strong acids, caustics or oxidizing agents.

o-Nitrophenol (0) is not compatible with Groups 2, 3, and 5-10.

Octyl nitrates (all isomers) see Alkyl (C7-C9) nitrates.

Oleum (0) is not compatible with Sulfuric acid (2) and 1,1,1-Trichloroethane (36).

Phthalate based polyester polyol (0) is not compatible with group 2, 3, 5, 7 and 12.

Pentene, Miscellaneous hydrocarbon mixtures (30) are not compatible with strong acids or oxidizing agents.

Polyglycerine, Sodium salts solution (20) is not compatible with Groups 1, 4, 11, 16, 17, 19, 21, and 22.

Sodium acetate, Glycol, Water mixture (1% or less Sodium hydroxide) (34) is not compatible with Group 12 (Isocyanates).

Sodium chlorate solution (50% or less) (0) is not compatible with Groups 1-3, 5, 7, 8, 10, 12, 13, 17, and 20.

Sodium dichromate solution (70% or less) (0) is not compatible with Groups 1-3, 5, 7, 8, 10, 12, 13, 17, and 20.

Sodium dimethyl naphthalene sulfonate solution (34) is not compatible with Group 12, Formaldehyde and strong oxidizing agents.

Sodium hydrogen sulfide, Sodium carbonate solution (0) is not compatible with Groups 6 (Ammonia) and 7 (Aliphatic amines).

Sodium hydrosulfide (5) is not compatible with Groups 6 (Ammonia) and 7 (Aliphatic amines).

Sodium hydrosulfide, Ammonium sulfide solution (5) is not compatible with Groups 6 (Ammonia) and 7 (Aliphatic amines).

Sodium polyacrylate solution (43) is not compatible with Group 3, Nitric Acid.

Sodium salt of Ferric hydroxyethylethylenediamine triacetic acid solution (43) is not compatible with Group 3, Nitric acid.

Sodium silicate solution (43) is not compatible with Group 3, Nitric acid.

Sodium sulfide, hydrosulfide solution (0) is not compatible with Groups 6 (Ammonia) and 7 (Aliphatic amines).

Sodium thiocyanate (56% or less) (0) is not compatible with Groups 1-4.

Sulfonated polyacrylate solution (43) is not compatible with Group 5 (Caustics).

Sulfuric acid (2) is not compatible with Fish oil (34), or Oleum (0).

Tallow fatty acid (34) is not compatible with Group 5, Caustics.

1,1,1-Trichloroethane (36) is not compatible with Oleum (0).

Trichlorethylene (36) is not compatible with Group 5, Caustics.

Triethyl phosphite (34) is not compatible with Groups 1 and 4.

Trimethyl phosphite (34) is not compatible with Groups 1 and 4.

1,3,5-Trioxane (41) is not compatible with Group 1 (Non-oxidizing mineral acids) and Group 4 (Organic acids).

## 8. INDEX OF SYNONYMS

SYNONYM	COMPOUND NAMES
300° oil	= Oils, miscellaneous: mineral seal
Aatrex herbicide	= Atrazine
Absorbent oil	= Oils, miscellaneous: absorption
Accelerator HX	= N-Ethylcyclohexylamine
Acetal	= Acetal
Acetaldehyde diethylacetal	= Acetal
Acetaldehyde, chloro-	= Chloroacetaldehyde
Acetaldehyde, trichloro	= Trichloroacetaldehyde
Acetaldehyde	= Acetaldehyde
p-Acetaldehyde	= Paraldehyde
Acetate C-7	= Heptyl acetate
Acetate C-9	= Nonyl acetate
Bis (Acetate) dioxouranium	= Uranyl acetate
(Acetato-o) phenyl mercury	= Phenylmercuric acetate
Acetatophenylmercury	= Phenylmercuric acetate
Acetic acid anhydride	= Acetic anhydride
Acetic acid n-amyl ester	= Amyl acetate (all isomers)
Acetic acid, 3-methoxybutyl ester	= 3-Methoxybutyl acetate
Acetic acid, ammonium salt	= Ammonium acetate
Acetic acid, benzyl ester	= Benzyl acetate
Acetic acid, chromium salt	= Chromic acetate
Acetic acid, cupric salt	= Copper acetate
Acetic acid, cyclohexyl ester	= Cyclohexyl acetate
Acetic acid, dimethylamide	= Dimethylacetamide
Acetic acid, dimethylamide	= N,N-Dimethyl acetamide solution (40% or less)
Acetic acid, ethyl ester	= Ethyl acetate
Acetic acid, fluoro-, sodium salt	= Sodium fluoroacetate
Acetic acid, heptyl ester	= Heptyl acetate
Acetic acid, hexyl ester	= Hexyl acetate
Acetic acid, isobutyl ester	= Isobutyl acetate
Acetic acid, isopropyl ester	= Isopropyl acetate
Acetic acid, methyl ester	= Methyl acetate
Acetic acid, n-butyl ester	= n-Butyl acetate
Acetic acid, n-nonyl ester	= Nonyl acetate
Acetic acid, n-propyl ether	= n-Propyl acetate
Acetic acid, nickel (II) salt	= Nickel acetate
Acetic acid, phenylmethyl ester	= Benzyl acetate
Acetic acid, sec-butyl ester	= sec-Butyl acetate
Acetic acid, tert-butyl ester	= tert-Butyl acetate
Acetic acid, thallium (I) salt	= Thallium acetate
Acetic acid, thallous salt	= Thallium acetate
Acetic acid, zinc salt	= Zinc acetate
Acetic acid	= Acetic acid
Acetic aldehyde	= Acetaldehyde
Acetic anhydride	= Acetic anhydride
Acetic ester	= Ethyl acetate
Acetic ether	= Ethyl acetate
Acetoacetic acid, ethyl ester	= Ethyl acetoacetate
Acetoacetic acid, methyl ester	= Methyl acetoacetate
Acetoacetic ester	= Ethyl acetoacetate

SYNONYM	COMPOUND NAMES
Acetocyanohydrin	= Lactonitrile solution (80% or less)
Acetone cyanohydrin	= Acetone cyanohydrin
Acetone	= Acetone
Acetonitrile	= Acetonitrile
Acetonyl bromide	= Bromoacetone
Acetophenone	= Acetophenone
alpha-Acetoxytoluene	= Benzyl acetate
Acetyl bromide	= Acetyl bromide
Acetyl chloride	= Acetyl chloride
Acetyl hydroperoxide	= Peracetic acid
Acetyl oxide	= Acetic anhydride
Acetyl peroxide solution	= Acetyl peroxide solution
Acetylacetone	= Acetylacetone
Acetylbenzene	= Acetophenone
Acetylene dichloride	= 1,2-Dichloroethylene
Acetylene tetrachloride	= Tetrachloroethane
Acetylene	= Acetylene
Acetylenogen	= Calcium carbide
Acetylmethyl bromide	= Bromoacetone
Acid ammonium carbonate	= Ammonium bicarbonate
Acid ammonium fluoride	= Ammonium bifluoride
Acraldehyde	= Acrolein
Acridine	= Acridine
Acrolein	= Acrolein
Acrylaldehyde	= Acrolein
Acrylamide solution	= Acrylamide solution
Acrylic acid amide (50%)	= Acrylamide solution
Acrylic acid, 2-ethylhexylester	= 2-Ethylhexyl acrylate
Acrylic acid, decyl ester	= n-Decyl acrylate
Acrylic acid, ethyl ester	= Ethyl acrylate
Acrylic acid, isobutyl ester	= iso-butyl acrylate
Acrylic acid, methyl ester	= Methyl acrylate
Acrylic acid, n-butyl ester	= n-Butyl acrylate
Acrylic acid	= Acrylic acid
Acrylic aldehyde	= Acrolein
Acrylic amide 50%	= Acrylamide solution
Acrylonitrile	= Acrylonitrile
Activated charcoal	= Charcoal
Adacene-12	= 1-Dodecene
Adipic acid, bis (2-ethylhexyl) ester	= Di-(2-ethylhexyl) adipate
Adipic acid, bis (2-ethylhexyl) ester	= Dioctyl adipate
Adipic acid, dimethyl ester	= Dimethyl adipate
Adipic acid	= Adipic acid
Adipinic acid	= Adipic acid
Adipol 2EH	= Dioctyl adipate
Adiponitrile	= Adiponitrile
Adronal	= Cyclohexanol
Aerosol surfactant	= Dioctyl sodium sulfosuccinate
Aerothene	= Trichloroethane
AIP	= Aluminum phosphide
Alaninol	= 2-Propanolamine
Albone	= Hydrogen peroxide
Albus	= Mercuric ammonium chloride
Alcohol C-10	= n-Decyl alcohol

SYNONYM	COMPOUND NAMES
Alcohol C-11 (undecylic)	= Undecanol
Alcohol C-8	= Octanol
Alcohol	= Ethyl alcohol
Aldehyde-collidine	= Methylethylpyridine
Aldehyde C-10	= Decaldehyde
Aldehydine	= Methylethylpyridine
Aldifen	= 2,4-Dinitrophenol
Aldrin	= Aldrin
Alfa-tox	= Diazinon
Alimet	= 2-Hydroxy-4-(methylthio)-butanoic acid
Alkaway liquid alkaline deruster	= Boiler compound, liquid
Alkron	= Methyl parathion
Alkyl(C <sub>11</sub> – C <sub>17</sub> )benzenesulfonic acid	= Alkyl(C <sub>11</sub> . C <sub>17</sub> )benzenesulfonic acid
Alkylbenzenesulfonic acid, sodium salt	= Sodium alkylbenzenesulfonates
Allene-methylacetylene mixture	= Methyl acetylene, propadiene mixture
Allomaleic acid	= Fumaric acid
Allyl alcohol	= Allyl alcohol
Allyl aldehyde	= Acrolein
Allyl bromide	= Allyl bromide
Allyl chloride	= Allyl chloride
Allyl chlorocarbonate	= Allyl chloroformate
Allyl chloroformate	= Allyl chloroformate
Allyl trichloride	= 1,2,3-Trichloropropane
Allylethylene	= 1,4-Pentadiene
Allylsilicone trichloride	= Allyltrichlorosilane
Allyltrichlorosilane	= Allyltrichlorosilane
alpha,alpha,alpha-trifluoro-2,6-Dinitro- n,n-dipropyl-p-toluidine	= Trifluralin
Alrowet D65	= Dioctyl sodium sulfosuccinate
Alum	= Aluminum sulfate
Aluminum chloride solution	= Aluminum chloride solution
Aluminum chloride	= Aluminum chloride
Aluminum ethyl dichloride	= Ethylaluminum dichloride
Aluminum fluoride	= Aluminum fluoride
Aluminum monophosphide	= Aluminum phosphide
Aluminum nitrate nonahydrate	= Aluminum nitrate
Aluminum nitrate	= Aluminum nitrate
Aluminum phosphide	= Aluminum phosphide
Aluminum sulfate solution	= Aluminum sulfate solution
Aluminum sulfate	= Aluminum sulfate
Aluminum triethyl	= Triethylaluminum
Aluminum triisobutyl	= Triisobutylaluminum
Amchlor	= Ammonium chloride
Amchloride	= Ammonium chloride
American palm kernel oil	= Oils, edible: tucum
3-Amino-1-methylbenzene	= m-Toluidine
2-Amino-1-methylbenzene	= o-Toluidine
4-Amino-1-methylbenzene	= p-Toluidine
2-Amino-1-propanol	= 2-Propanolamine
3-Amino-1-propanol	= n-Propanolamine
1-Amino-2-ethylhexane	= 2-Ethylhexylamine
1-Amino-2-fluorobenzene	= 2-Fluoroaniline
2-Amino-2-methyl-1-propanol (90% or less)	= 2-Amino-2-methyl-1-propanol (90% or less)

SYNONYM	COMPOUND NAMES
1-Amino-2-methylpropane	= Isobutylamine
2-Amino-2-methylpropane	= tert-Butylamine
1-Amino-2-nitrobenzene	= 2-Nitroaniline
1-Amino-2-propanol	= Monoisopropanolamine
1-Amino-4-chlorobenzene	= p-chloroaniline
1-Amino-4-fluorobenzene	= 4-Fluoroaniline
1-Amino-4-nitrobenzene	= 4-Nitroaniline
2-Amino-5-chlorotoluene	= 4-Chloro-o-toluidine
Aminobenzene	= Aniline
1-Aminobutane	= n-Butylamine
Aminocaproic lactam	= Caprolactam
Aminocyclohexane	= Cyclohexylamine
Aminodimethylbenzene	= 2,6-Dimethylaniline
2-Aminodimethylethanol	= 2-Amino-2-methyl-1-propanol (90% or less)
Aminoethane	= Ethylamine
2-Aminoethanol	= Monoethanolamine
beta-Aminoethyl alcohol	= Monoethanolamine
N-Aminoethyl piperazine	= N-Aminoethyl piperazine
Bis-(2-Aminoethyl) amine	= Diethylenetriamine
2-[(2-Aminoethyl) amino] ethanol	= Aminoethylethanolamine
N-(2-Aminoethyl) ethanolamine	= Aminoethylethanolamine
N-(2-Aminoethyl) piperazine	= N-Aminoethyl piperazine
1-(2-Aminoethyl) piperazine	= N-Aminoethyl piperazine
N,N'-bis-(2-Aminoethyl)ethylenediamine	= Triethylenetetramine
Aminoethylethanolamine	= Aminoethylethanolamine
Aminoform	= Hexamethylenetetramine
2-Aminoisobutane	= tert-Butylamine
beta-Aminoisobutanol	= 2-Amino-2-methyl-1-propanol (90% or less)
Aminomercuric chloride	= Mercuric ammonium chloride
Aminomethane	= Methylamine
Aminomethane	= Methylamine solution
3-Aminomethyl-3,5,5-trimethylcyclohexylamine	= Isophorone diamine
1-Aminonaphthalene	= 1-Naphthylamine
2-Aminopropane	= Isopropylamine
1-Aminopropane	= n-Propylamine
4-Aminopyridine	= 4-Aminopyridine
p-Aminopyridine	= 4-Aminopyridine
alpha-Aminotoluene	= Benzylamine
3-Aminotoluene	= m-Toluidine
2-Aminotoluene	= o-Toluidine
4-Aminotoluene	= p-Toluidine
Ammate	= Ammonium sulfamate
Ammoneric	= Ammonium chloride
Ammonia soap	= Ammonium oleate
Ammonia solution	= Ammonium hydroxide (<28% aqueous ammonia)
Ammonia water	= Ammonium hydroxide (<28% aqueous ammonia)
Ammonia, anhydrous	= Ammonia, anhydrous
Ammoniated mercury	= Mercuric ammonium chloride
Ammonioformaldehyde	= Hexamethylenetetramine



SYNONYM	COMPOUND NAMES
Ammonium acetate	= Ammonium acetate
Ammonium acid fluoride	= Ammonium bifluoride
Ammonium amidosulfonate	= Ammonium sulfamate
Ammonium amidosulphate	= Ammonium sulfamate
Ammonium aminoformate	= Ammonium carbamate
Ammonium benzoate	= Ammonium benzoate
Ammonium bicarbonate	= Ammonium bicarbonate
Ammonium bichromate	= Ammonium dichromate
Ammonium bifluoride	= Ammonium bifluoride
Ammonium bisulfite	= Ammonium bisulfite
Ammonium borofluoride	= Ammonium fluoborate
Ammonium bromide	= Ammonium bromide
Ammonium carbamate	= Ammonium carbamate
Ammonium carbazotate	= Ammonium picrate, wet
Ammonium carbonate	= Ammonium carbonate
Ammonium chloride	= Ammonium chloride
Ammonium chromate	= Ammonium chromate
Ammonium citrate, dibasic	= Ammonium citrate, dibasic
Ammonium citrate, dibasic	= Ammonium citrate, dibasic
Ammonium citrate	= Ammonium citrate, dibasic
Ammonium cupric sulfate	= Copper sulfate, ammoniated
Ammonium decaborate octahydrate	= Ammonium pentaborate
Ammonium dichromate	= Ammonium dichromate
Ammonium disulfatonickelate (II)	= Nickel ammonium sulfate
Ammonium ferric citrate	= Ferric ammonium citrate
Ammonium ferric oxalate trihydrate	= Ferric ammonium oxalate
Ammonium ferrous sulfate	= Ferrous ammonium sulfate
Ammonium fluoborate	= Ammonium fluoborate
Ammonium fluoride	= Ammonium fluoride
Ammonium fluorosilicate	= Ammonium silicofluoride
Ammonium formate	= Ammonium formate
Ammonium gluconate	= Ammonium gluconate
Ammonium hydrogen carbonate	= Ammonium bicarbonate
Ammonium hydrogen difluoride	= Ammonium bifluoride
Ammonium hydrogen fluoride	= Ammonium bifluoride
Ammonium hydrogen sulfide solution	= Ammonium sulfide
Ammonium hydrogen sulfite	= Ammonium bisulfite
Ammonium hydrosulfite	= Ammonium bisulfite
Ammonium hydroxide (<28% aqueous ammonia)	= Ammonium hydroxide (<28% aqueous ammonia)
Ammonium hypo solution	= Ammonium thiosulfate solution (60% or less)
Ammonium hypophosphite	= Ammonium hypophosphite
Ammonium hyposulfite solution	= Ammonium thiosulfate solution (60% or less)
Ammonium hyposulfite	= Ammonium thiosulfate
Ammonium iodide	= Ammonium iodide
Ammonium lactate syrup	= Ammonium lactate
Ammonium lactate	= Ammonium lactate
Ammonium lauryl sulfate	= Ammonium lauryl sulfate
Ammonium molybdate	= Ammonium molybdate
Ammonium monosulfite	= Ammonium bisulfite
Ammonium muriate	= Ammonium chloride
Ammonium nickel sulfate	= Nickel ammonium sulfate

SYNONYM	COMPOUND NAMES
Ammonium nitrate-phosphate mixture	= Ammonium nitrate-phosphate mixture
Ammonium nitrate-sulfate mixture	= Ammonium nitrate-sulfate mixture
Ammonium nitrate-urea solution	= Ammonium nitrate-urea solution
Ammonium nitrate	= Ammonium nitrate
Ammonium oleate	= Ammonium oleate
Ammonium oxalate hydrate	= Ammonium oxalate
Ammonium oxalate	= Ammonium oxalate
Ammonium pentaborate tetrahydrate	= Ammonium pentaborate
Ammonium pentaborate	= Ammonium pentaborate
Ammonium pentachlorozincate	= Zinc ammonium chloride
Ammonium perchlorate	= Ammonium perchlorate
Ammonium peroxydisulfate	= Ammonium persulfate
Ammonium persulfate	= Ammonium persulfate
Ammonium phosphate, dibasic	= Ammonium phosphate
Ammonium phosphate	= Ammonium phosphate
Ammonium picrate (yellow)	= Ammonium picrate, wet
Ammonium picrate, wet	= Ammonium picrate, wet
Ammonium picronitrate	= Ammonium picrate, wet
Ammonium rhodanate	= Ammonium thiocyanate
Ammonium rhodanide	= Ammonium thiocyanate
Ammonium silicofluoride	= Ammonium silicofluoride
Ammonium stearate dispersion	= Ammonium stearate
Ammonium stearate	= Ammonium stearate
Ammonium sulfamate	= Ammonium sulfamate
Ammonium sulfate	= Ammonium sulfate
Ammonium sulfhydrate solution	= Ammonium sulfide
Ammonium sulfide solution	= Ammonium sulfide
Ammonium sulfide	= Ammonium sulfide
Ammonium sulfite	= Ammonium sulfite
Ammonium sulfocyanate	= Ammonium thiocyanate
Ammonium sulfocyanide	= Ammonium thiocyanate
Ammonium tartrate	= Ammonium tartrate
Ammonium tetrafluoborate	= Ammonium fluoborate
Ammonium thiocyanate	= Ammonium thiocyanate
Ammonium thiosulfate solution (60% or less)	= Ammonium thiosulfate solution (60% or less)
Ammonium thiosulfate	= Ammonium thiosulfate
Ammonium trioxalatoferrate(III) trihydrate	= Ferric ammonium oxalate
Ammonium zinc chloride	= Zinc ammonium chloride
Amorphous phosphorus	= Phosphorus, red
AMP-95	= 2-Amino-2-methyl-1-propanol (90% or less)
AMP	= 2-Amino-2-methyl-1-propanol (90% or less)
AMS	= Ammonium sulfamate
Amyl acetate (all isomers)	= Amyl acetate (all isomers)
Amyl acetate, mixed isomers	= Amyl acetate (all isomers)
sec-Amyl acetate	= sec-Amyl acetate
tert-Amyl acetate	= tert-Amyl acetate
1-Amyl alcohol	= n-Amyl alcohol
n-Amyl alcohol	= n-Amyl alcohol
Amyl aldehyde	= n-Valeraldehyde
Amyl aldehyde	= Valeraldehyde
n-Amyl chloride	= n-Amyl chloride

SYNONYM	COMPOUND NAMES
Amyl chloride	= n-Amyl chloride
Amyl ethyl ketone	= Ethyl amyl ketone
Amyl hydrosulfide	= n-Amyl mercaptan
n-Amyl mercaptan	= n-Amyl mercaptan
n-Amyl methyl ketone	= n-Amyl methyl ketone
n-Amyl nitrate	= n-Amyl nitrate
iso-Amyl nitrite	= iso-Amyl nitrite
Amyl nitrite	= iso-Amyl nitrite
Amyl phthalate	= Amyl phthalate
n-Amyl propionate	= n-Pentyl propionate
Amyl sulfhydrate	= n-Amyl mercaptan
Amyl thioalcohol	= n-Amyl mercaptan
n-Amylcarbinol	= 1-Hexanol
Amylcarbinol	= 1-Hexanol
alpha-n-Amylene	= 1-Pentene
n-Amyltrichlorosilane	= n-Amyltrichlorosilane
Anacardic acid	= Oil, misc: cashew nut shell
Anesthesia ether	= Ethyl ether
Anesthetic ether	= Ethyl ether
Anglislite	= Lead sulfate
"Anhydride" of ammonium carbonate	= Ammonium carbamate
Anhydrone	= Magnesium perchlorate
Anhydrous aluminum chloride	= Aluminum chloride
Anhydrous chloral	= Trichloroacetaldehyde
Aniline oil	= Aniline
Aniline, 2,6-diethyl	= 2,6-Diethylaniline
Aniline, 2,6-dimethyl	= 2,6-Dimethylaniline
Aniline	= Aniline
Anilinobenzene	= Diphenylamine
Anilinomethane	= N-Methylaniline
Animal carbon	= Charcoal
o-Anisic acid	= Methyl salicylate
Anisoyl chloride	= Anisoyl chloride
p-Anisoyl chloride	= Anisoyl chloride
Anol	= Cyclohexanol
Anone	= Cyclohexanone
Ansar	= Cacodylic acid
Ansul ether 12'	= Ethylene glycol dimethyl ether
Ansul ether 121	= Ethylene glycol dimethyl ether
Anthon	= Trichlorfon
Anthracene	= Anthracene
Anthracin	= Anthracene
Antimonous bromide	= Antimony tribromide
Antimony (III) chloride	= Antimony trichloride
Antimony (V) chloride	= Antimony pentachloride
Antimony pentachloride	= Antimony pentachloride
Antimony pentafluoride	= Antimony pentafluoride
Antimony perchloride	= Antimony pentachloride
Antimony potassium tartrate	= Antimony potassium tartrate
Antimony tribromide	= Antimony tribromide
Antimony trichloride	= Antimony trichloride
Antimony trifluoride	= Antimony trifluoride
Antimony trioxide	= Antimony trioxide
Aouara oil	= Oils, edible: tucum

SYNONYM	COMPOUND NAMES
APO	= Tris(Aziridinyl)phosphine oxide
Aqua ammonia	= Ammonium hydroxide (<28% aqueous ammonia)
Aquacide	= Diquat
Aqueous ammonia	= Ammonium hydroxide (<28% aqueous ammonia)
Arcosolv	= Dipropylene glycol methyl ether
Arcton 6	= Dichlorodifluoromethane
Arcton 9	= Trichlorofluoromethane
Argentous fluoride	= Silver fluoride
Argentous oxide	= Silver oxide
Arizole	= Oil, misc: pine
Arochlor	= Polychlorinated biphenyl
Arosol	= Ethylene glycol phenyl ether
Arsecodile	= Sodium cacodylate
Arsenic acid anhydride	= Arsenic pentaoxide
Arsenic acid	= Arsenic acid
Arsenic chloride	= Arsenic trichloride
Arsenic disulfide	= Arsenic disulfide
Arsenic oxide	= Arsenic pentaoxide
Arsenic pentaoxide	= Arsenic pentaoxide
Arsenic pentoxide	= Arsenic acid
Arsenic pentoxide	= Arsenic pentaoxide
Arsenic sesquioxide	= Arsenic trioxide
Arsenic trichloride	= Arsenic trichloride
Arsenic trioxide	= Arsenic trioxide
Arsenic trisulfide	= Arsenic trisulfide
Arsenic yellow	= Arsenic trisulfide
Arsenic, metallic	= Arsenic
Arsenic, solid	= Arsenic
Arsenic	= Arsenic
Arsenious acid, potassium salt	= Potassium arsenite
Arsenious chloride	= Arsenic trichloride
Arsenous acid anhydride	= Arsenic trioxide
Arsenous acid, calcium salt	= Calcium arsenite
Arsenous acid	= Arsenic trioxide
Arsenous chloride	= Arsenic trichloride
Arsenous oxide	= Arsenic trioxide
Arsicodile	= Sodium cacodylate
Arsycodile	= Sodium cacodylate
Arthodibrom	= Naled
Artic	= Methyl chloride
Artificial cinnabar	= Mercuric sulfide
Asphalt blending stocks: roofers flux	= Asphalt blending stocks: roofers flux
Asphalt blending stocks: straight run residue	= Asphalt blending stocks: straight run residue
Asphalt cements	= Asphalt
Asphalt	= Asphalt
Asphaltic bitumen	= Asphalt
Asphaltum oil	= Asphalt blending stocks: roofers flux
Asphaltum	= Asphalt blending stocks: roofers flux
ATE	= Triethylaluminum
Atrazine	= Atrazine
Australene	= Pinene

SYNONYM	COMPOUND NAMES
Avitrol	= 4-Aminopyridine
Avlothane	= Hexachloroethane
Avolin	= Dimethyl phthalate
10-Azaanthracene	= Acridine
Azacycloheptane	= Hexamethylenimine
1-Azanaphthalene	= Quinoline
Azinphos methyl	= Azinphos methyl
Azirane	= Ethyleneimine
Aziridine	= Ethyleneimine
Tris(1-AziridinyI) phosphine oxide	= Tris(AziridinyI)phosphine oxide
Tris(AziridinyI)phosphine oxide	= Tris(AziridinyI)phosphine oxide
Azoic diazo component 37	= 4-Nitroaniline
Azoic diazo component 6	= 2-Nitroaniline
Banana oil	= Isoamylacetate
Banana oil	= sec-Amyl acetate
Banvel D	= Dicamba
Barium binoxide	= Barium peroxide
Barium carbonate	= Barium carbonate
Barium chlorate monohydrate	= Barium chlorate
Barium chlorate	= Barium chlorate
Barium cyanide solid	= Barium cyanide
Barium cyanide	= Barium cyanide
Barium dioxide	= Barium peroxide
Barium nitrate	= Barium nitrate
Barium perchlorate trihydrate	= Barium perchlorate
Barium perchlorate	= Barium perchlorate
Barium permanganate	= Barium permanganate
Barium peroxide	= Barium peroxide
Barium superoxide	= Barium peroxide
Basic bismuth choride	= Bismuth oxychloride
Basic copper acetate	= Copper subacetate
Basic zirconium chloride	= Zirconium oxychloride
Battery acid	= Sulfuric acid
Bay 37344	= Mercaptodimethur
Bayer 13/59	= Trichlorfon
Bearing oil	= Oils, miscellaneous: spindle
Beet sugar	= Sucrose
Benzal chloride	= Benzal chloride
Benzaldehyde	= Benzaldehyde
1-Benzazine	= Quinoline
Benzenamine	= Aniline
Benzene-1,3-dicarboxylic acid	= Isophthalic acid
Benzene chloride	= Chlorobenzene
1,2-Benzene dicarboxylic acid, di-(2-methylpropyl)ester	= Diisobutyl phthalate
Benzene fluoride	= Fluorobenzene
gamma-Benzene hexachloride	= gamma-Benzene hexachloride
Benzene phosphorus dichloride	= Benzene phosphorus dichloride
Benzene phosphorus thiodichloride	= Benzene phosphorus thiodichloride
Benzene sulfochloride	= Benzenesulfonyl chloride
Benzene sulfonechloride	= Benzenesulfonyl chloride
Benzene, 1-chloro-2-methyl	= o-Chlorotoluene
Benzene, 1,2,3-trichloro-	= 1,2,3-Trichlorobenzene
Benzene, 1,2,4-trichloro-	= 1,2,4-Trichlorobenzene

SYNONYM	COMPOUND NAMES
Benzene, diisopropyl	= Diisopropylbenzene (all isomers)
Benzene, hexachloro-	= Hexachlorobenzene
Benzene, propyl	= n-Propylbenzene
Benzene	= Benzene
Benzeneamine, 2,6-diethyl- (9ci)	= 2,6-Diethylaniline
Benzenecarbinol	= Benzyl alcohol
Benzenecarbonyl chloride	= Benzoyl chloride
Benzenecarboxylic acid	= Benzoic acid
1,2-Benzenedicarboxylic acid anhydride	= Phthalic anhydride
1,2-Benzenedicarboxylic acid, di-isononyl ester	= Diisononyl phthalate
1,2-Benzenedicarboxylic acid, di-undecyl ester	= Diundecyl phthalate
1,2-Benzenedicarboxylic acid, diethyl ester	= Diethyl phthalate
1,2-Benzenedicarboxylic acid, dipentyl ester	= Amyl phthalate
1,2-Benzenediol	= Catechol
1,4-Benzenediol	= Hydroquinone
1,3-Benzenediol	= Resorcinol
Benzenesulfochloride	= Benzenesulfonyl chloride
Benzenesulfonic (acid) chloride	= Benzenesulfonyl chloride
Benzenesulfonyl chloride	= Benzenesulfonyl chloride
Benzenethiol	= Benzenethiol
Benzenethiophosphonyl chloride	= Benzene phosphorus thiodichloride
1,2,3-Benzenetriol	= Pyrogalllic acid
Benzidine	= Benzidine
Benzinoform	= Carbon tetrachloride
Benzo (b) pyridine	= Quinoline
Benzo (b) quinoline	= Acridine
Benzoflex 9-88 SG	= Dipropylene glycol dibenzoate
Benzoflex 9-88	= Dipropylene glycol dibenzoate
Benzoflex 9-98	= Dipropylene glycol dibenzoate
Benzoic acid nitrile	= Benzonitrile
Benzoic acid, 2-methoxy-	= Methyl salicylate
Benzoic acid, ammonium salt	= Ammonium benzoate
Benzoic acid, methyl ester	= Methyl benzoate
Benzoic acid	= Benzoic acid
Benzoic aldehyde	= Benzaldehyde
Benzol	= Benzene
Benzole	= Benzene
Benzonitrile	= Benzonitrile
Benzophenone	= Benzophenone
p-Benzoquinone	= p-Benzoquinone
Benzoquinone	= p-Benzoquinone
1,4-Benzoquinone	= p-Benzoquinone
2-Benzothiazolethiol, sodium salt	= Sodium 2-mercaptobenzothiazol solution
2-(3h)-Benzothiazolethione, sodium salt	= Sodium 2-mercaptobenzothiazol solution
Benzoyl benzene	= Benzophenone
Benzoyl chloride	= Benzoyl chloride
Benzoyl peroxide	= Dibenzoyl peroxide
Benzoyl superoxide	= Dibenzoyl peroxide
Benzyl acetate	= Benzyl acetate
Benzyl alcohol	= Benzyl alcohol

SYNONYM	COMPOUND NAMES
Benzyl bromide	= Benzyl bromide
Benzyl chloride	= Benzyl chloride
Benzyl chlorocarbonate	= Benzyl chloroformate
Benzyl chloroformate	= Benzyl chloroformate
Benzyl dichloride	= Benzal chloride
Benzyl dimethylamine	= Benzyl dimethylamine
Benzyl ethanoate	= Benzyl acetate
Benzyl ether	= Dibenzyl ether
Benzyl n-butyl phthalate	= Butyl benzyl phthalate
Benzylamine	= Benzylamine
Benzylcarbonyl chloride	= Benzyl chloroformate
Benzyl dimethyloctadecyl ammonium chloride	= Benzyl dimethyloctadecyl ammonium chloride
Benzyl dimethylstearyl ammonium chloride	= Benzyl dimethylstearyl ammonium chloride
Benzylene chloride	= Benzal chloride
Benzylidene chloride	= Benzal chloride
Benzyltrimethylammonium chloride	= Benzyltrimethylammonium chloride
Beryllia	= Beryllium oxide
Beryllium chloride	= Beryllium chloride
Beryllium fluoride	= Beryllium fluoride
Beryllium nitrate trihydrate	= Beryllium nitrate
Beryllium nitrate	= Beryllium nitrate
Beryllium oxide	= Beryllium oxide
Beryllium sulfate tetrahydrate	= Beryllium sulfate
Beryllium sulfate	= Beryllium sulfate
Beryllium	= Beryllium
beta-trichloroethane	= 1,1,2-Trichloroethane
Betraprone	= beta-Propiolactone
Betula or gaultheria oil	= Methyl salicylate
BHC	= gamma-Benzene hexachloride
p,p'-Bianiline	= Benidine
Bibenzene	= Diphenyl
Bichrome	= Potassium dichromate
Bieberite	= Cobalt sulfate
Biethylene	= Butadiene
Biformyl	= Glyoxal
Bioflex 91	= Dinonyl phthalate
(1,1'-Biphenyl)-4,4'-diamine	= Benidine
Biphenyl	= Diphenyl
1,1'-Biphenyl	= Diphenyl
Bis(2-ethylhexyl) adipate	= Di-(2-ethylhexyl) adipate
Bis(glycinato) copper	= Copper glycinate
Bis(methylcyclopentadiene)	= Methylcyclopentadiene dimer
Bismuth chloride oxide	= Bismuth oxychloride
Bismuth oxychloride	= Bismuth oxychloride
Bismuth subchloride	= Bismuth oxychloride
Bismuthyl chloride	= Bismuth oxychloride
Bisphenol A - epichlorohydrin condensate	= Bisphenol A diglycidyl ether
Bisphenol A diglycidyl ether	= Bisphenol A diglycidyl ether
Bisphenol A	= Bisphenol A
Bitumen	= Asphalt
Bivinyll	= Butadiene

SYNONYM	COMPOUND NAMES
Black leaf 40 (40% water solution)	= Nicotine sulfate
Bladan	= Tetraethyl pyrophosphate
Bleach	= Sodium hypochlorite solution
Blue oil	= Aniline
Blue verdigris	= Copper subacetate
Blue vitriol	= Copper sulfate
Boiler compound, liquid	= Boiler compound, liquid
Boletic acid	= Fumaric acid
Boracic acid	= Boric acid
Borax, anhydrous	= Sodium borate
Boric acid	= Boric acid
Borohydride	= Sodium borohydride
Borohydride	= Sodium hydroxide solution
Boron chloride	= Boron trichloride
Boron tribromide	= Boron tribromide
Boron trichloride	= Boron trichloride
Bottled gas	= Liquefied petroleum gas
Box toe gum	= Collodion
BP	= Dibenzoyl peroxide
BPO	= Dibenzoyl peroxide
Brimstone	= Sulfur
Brocide	= Ethylene dichloride
Bromallylene	= Allyl bromide
Bromelite	= Beryllium oxide
Bromex	= Naled
Bromine pentafluoride	= Bromine pentafluoride
Bromine trifluoride	= Bromine trifluoride
Bromine	= Bromine
1-Bromo-2-propanone	= Bromoacetone
Bromo-2-propanone	= Bromoacetone
Bromoacetone	= Bromoacetone
Bromoacetyl bromide	= Bromoacetyl bromide
Bromobenzene	= Bromobenzene
Bromobenzol	= Bromobenzene
1-Bromobutane	= 1-Bromobutane
n-Bromobutane	= 1-Bromobutane
2-Bromobutane	= 2-Bromobutane
Bromoethanoyl bromide	= Bromoacetyl bromide
Bromoform	= Bromoform
Bromofume	= Ethylene dibromide
Bromomethane	= Methyl bromide
Bromomethyl methyl ketone	= Bromoacetone
2-Bromopentane	= 2-Bromopentane
1-Bromopropane	= 1-Bromopropane
3-Bromopropene	= Allyl bromide
3-Bromopropylene	= Allyl bromide
Bromotoluene, alpha	= Benzyl bromide
omega-Bromotoluene	= Benzyl bromide
alpha-Bromotoluene	= Benzyl bromide
(-)Brucine dihydrate	= Brucine
Brucine	= Brucine
BTMAC	= Benzyltrimethylammonium chloride
Bunker C oil	= Oils, fuel: no. 6
1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	= Hexachlorobutadiene



SYNONYM	COMPOUND NAMES
Butadiene	= Butadiene
1,3-Butadiene	= Butadiene
Butaldehyde	= n-Butyraldehyde
Butanal	= n-Butyraldehyde
1-Butanamine, n-butyl	= Di-n-butylamine
Butane	= Butane
n-Butane	= Butane
1,4-Butanedicarboxylic acid	= Adipic acid
1,4-Butanediol	= 1,4-Butanediol
Butanediol	= Butylene glycol
Butanenitrile	= Butyronitrile
1-Butanethiol	= n-Butyl mercaptan
Butanic acid	= n-Butyric acid
Butanoic acid, 3-oxo-methyl ester (9ci)	= Methyl acetoacetate
Butanoic acid, butyl ester	= Butyl butyrate
Butanoic acid, methyl ester	= Methyl butyrate
Butanoic acid	= n-Butyric acid
1-Butanol, 3-methoxyacetate	= 3-Methoxybutyl acetate
Butanol	= n-Butyl alcohol
1-Butanol	= n-Butyl alcohol
2-Butanol	= sec-Butyl alcohol
2-Butanone peroxide	= 2-Butanone peroxide
2-Butanone, peroxide	= 2-Butanone peroxide
2-Butanone	= Methyl ethyl ketone
Butanox M50, M105, LPT	= 2-Butanone peroxide
Butanoyl chloride	= Butyryl chloride
3-Buten-2-one	= Methyl vinyl ketone
1-Buten-3-ol, 3-methyl	= Methyl butenol
trans-2-Butenal	= Crotonaldehyde
cis-2-Butene-1, 4-diol	= 1,4-Butenediol
2-Butene-1, 4-diol	= 1,4-Butenediol
1-Butene oxide	= 1,2-Butylene oxide
Butene resins	= Polybutene
1-Butene	= Butylene
trans-Butenedioic acid	= Fumaric acid
cis-Butenedioic acid	= Maleic acid
cis-Butenedioic anhydride	= Maleic anhydride
1,4-Butenediol	= 1,4-Butenediol
1-Butoxy-2,3-epoxypropane	= n-Butyl glycidyl ether
1-Butoxy butane	= Di-n-butyl ether
Butoxydiethylene glycol	= Diethylene glycol monobutyl ether
Butoxydiglycol	= Diethylene glycol monobutyl ether
2-Butoxyethanol acetate	= Ethylene glycol monobutyl ether acetate
2-Butoxyethanol	= Ethylene glycol monobutyl ether
2-(2-Butoxyethoxy) ethanol acetate	= Diethylene glycol monobutyl ether acetate
2-(2-Butoxyethoxy) ethanol	= Diethylene glycol monobutyl ether
2-Butoxyethyl acetate	= Ethylene glycol monobutyl ether acetate
Bis(2-Butoxyethyl) ether	= Diethylene glycol dibutyl ether
Butoxyl	= 3-Methoxybutyl acetate
Butoxypropyl trichlorophenoxyacetate	= 2,4,5-T esters
Butyric acid, 2-hydroxy-4-methylthio-	= 2-Hydroxy-4-(methylthio)-butanoic acid
Butter of antimony	= Antimony trichloride
Butter of arsenic	= Arsenic trichloride

SYNONYM	COMPOUND NAMES
Buttercup yellow	= Zinc chromate
Butyl "carbitol" acetate	= Diethylene glycol monobutyl ether acetate
Butyl "carbitol"	= Diethylene glycol monobutyl ether
Butyl "cellosolve" acetate	= Ethylene glycol monobutyl ether acetate
Butyl 2-methacrylate	= n-Butyl methacrylate
Butyl 2-methyl-2-propenoate	= n-Butyl methacrylate
n-Butyl 2-propenoate	= n-Butyl acrylate
Butyl 2,4-dichlorophenoxyacetate	= 2,4-D esters
Butyl 2,4,5- trichlorophenoxyacetate	= 2,4,5-T esters
Butyl a-hydroxypropionate	= Butyl lactate
n-Butyl acetate	= n-Butyl acetate
Butyl acetate	= n-Butyl acetate
sec-Butyl acetate	= sec-Butyl acetate
tert-Butyl acetate	= tert-Butyl acetate
iso-Butyl acrylate	= iso-butyl acrylate
n-Butyl acrylate	= n-Butyl acrylate
Butyl acrylate	= n-Butyl acrylate
Butyl alcohol	= n-Butyl alcohol
n-Butyl alcohol	= n-Butyl alcohol
sec-Butyl alcohol	= sec-Butyl alcohol
tert-Butyl alcohol	= tert-Butyl alcohol
Butyl aldehyde	= n-Butyraldehyde
n-Butyl alpha-methylacrylate	= n-Butyl methacrylate
Butyl benzyl phthalate	= Butyl benzyl phthalate
n-Butyl bromide	= 1-Bromobutane
Butyl bromide	= 1-Bromobutane
sec-Butyl bromide	= 2-Bromobutane
Butyl butanoate	= Butyl butyrate
Butyl butyrate	= Butyl butyrate
Butyl cellosolve	= Ethylene glycol monobutyl ether
n-Butyl chloride	= Butyl chloride
Butyl chloride	= Butyl chloride
n-Butyl chlorocarbonate	= n-Butyl chloroformate
n-Butyl chloroformate	= n-Butyl chloroformate
Butyl diglyme	= Diethylene glycol dibutyl ether
Butyl ethanoate	= n-Butyl acetate
Butyl ether	= Di-n-butyl ether
n-Butyl ether	= Di-n-butyl ether
Butyl ethyl ketone	= Ethyl butyl ketone
n-Butyl formal	= n-Valeraldehyde
n-Butyl formate	= n-Butyl formate
n-Butyl glycidyl ether	= n-Butyl glycidyl ether
tert-Butyl hydroperoxide	= tert-Butyl hydroperoxide
Butyl lactate	= Butyl lactate
n-Butyl mercaptan	= n-Butyl mercaptan
n-Butyl methacrylate	= n-Butyl methacrylate
Butyl methacrylate	= n-Butyl methacrylate
tert-Butyl methyl ether	= Methyl tert-butyl ether
n-Butyl methyl ketone	= Methyl n-butyl ketone
Butyl phthalate	= Dibutyl phthalate
n-Butyl propionate	= n-Butyl propionate
Butyl titanate monomer	= Tetrabutyl titanate
Butyl titanate	= Tetrabutyl titanate

SYNONYM	COMPOUND NAMES
Butyl toluene	= Butyl toluene
Butyl, decyl, cetyl-eicosyl methacrylate	= Butyl, decyl, cetyl-eicosyl methacrylate
Butyl, decyl, cetyl, eicosyl 2-methyl-2-propenoate	= Butyl, decyl, cetyl-eicosyl methacrylate
Butylacetic acid	= Hexanoic acid
Butylaldehyde	= n-Butyraldehyde
iso-Butylamine	= Isobutylamine
n-Butylamine	= n-Butylamine
Butylamine	= n-Butylamine
Mono-n-Butylamine	= n-Butylamine
sec-Butylamine	= sec-Butylamine
tert-Butylamine	= tert-Butylamine
n-Butylcarbinol	= n-Amyl alcohol
n-Butylcarbonyl chloride	= n-Amyl chloride
2-Butylene dichloride	= Dichlorobutene
1,4-Butylene glycol	= 1,4-Butanediol
Butylene glycol	= Butylene glycol
Butylene hydrate	= sec-Butyl alcohol
Butylene oxide	= 1,2-Butylene oxide
Alpha-Butylene oxide	= 1,2-Butylene oxide
1,2-Butylene oxide	= 1,2-Butylene oxide
Butylene	= Butylene
Butylethylacetaldehyde	= Ethylhexaldehyde
Butylethylacetaldehyde	= Ethylhexaldehyde
Butylethylacetic acid	= 2-Ethylhexanoic acid
Butylethylamine	= N-Ethyl-n-butylamine
p-tert-Butylphenol	= p-tert-butylphenol
p-tert-Butyltoluene	= Butyl toluene
4-tert-Butyltoluene	= Butyl toluene
n-Butyltrichlorosilane	= Butyltrichlorosilane
Butyltrichlorosilane	= Butyltrichlorosilane
2-Butyne-1, 4-diol	= 1,4-Butynediol
1,4-Butynediol	= 1,4-Butynediol
iso-Butyraldehyde	= iso-butyraldehyde
n-Butyraldehyde	= n-Butyraldehyde
Butyraldehyde	= n-Butyraldehyde
Butyric acid nitrile	= Butyronitrile
Butyric acid, butyl ester	= Butyl butyrate
Butyric acid, ethyl ester	= Ethyl butyrate
Butyric acid, methyl ester	= Methyl butyrate
n-Butyric acid	= n-Butyric acid
Butyric acid	= n-Butyric acid
Butyric aldehyde	= n-Butyraldehyde
Butyric ether	= Ethyl butyrate
Butyrol chloride	= Butyryl chloride
Butyronitrile	= Butyronitrile
n-Butyryl chloride	= Butyryl chloride
Butyryl chloride	= Butyryl chloride
C-1297	= Lauric acid
C-8 acid	= Octanoic acid
Cacodylic acid	= Cacodylic acid
Cadmium acetate dihydrate	= Cadmium acetate
Cadmium acetate	= Cadmium acetate
Cadmium bromide tetrahydrate	= Cadmium bromide

SYNONYM	COMPOUND NAMES
Cadmium bromide	= Cadmium bromide
Cadmium chloride	= Cadmium chloride
Cadmium fluoborate solution	= Cadmium fluoroborate
Cadmium fluoborate	= Cadmium fluoroborate
Cadmium fluoroborate	= Cadmium fluoroborate
Cadmium fume	= Cadmium oxide
Cadmium nitrate tetrahydrate	= Cadmium nitrate
Cadmium nitrate	= Cadmium nitrate
Cadmium oxide	= Cadmium oxide
Cadmium sulfate	= Cadmium sulfate
Cadox HDP	= Cyclohexanone peroxide
Cadox PS	= Di-(p-chlorobenzoyl) peroxide
Cadox TBH	= tert-Butyl hydroperoxide
Cake aluminum	= Aluminum sulfate
Calamine	= Zinc carbonate
Calcium abietate	= Calcium resinate
Calcium abietate	= Calcium resinate
Calcium alkylaromatic sulfonate	= Dodecylbenzenesulfonic acid, calcium salt
Calcium alkylbenzenesulfonate	= Dodecylbenzenesulfonic acid, calcium salt
Calcium arsenate	= Calcium arsenate
Calcium arsenite solid	= Calcium arsenite
Calcium arsenite	= Calcium arsenite
Calcium biphosphate	= Calcium phosphate
Calcium carbide	= Calcium carbide
Calcium chlorate	= Calcium chlorate
Calcium chloride hydrates	= Calcium chloride
Calcium chloride, anhydrous	= Calcium chloride
Calcium chloride	= Calcium chloride
Calcium chromate (vi)	= Calcium chromate
Calcium chromate dihydrate	= Calcium chromate
Calcium chromate	= Calcium chromate
Calcium cyanide	= Calcium cyanide
Calcium dioxide	= Calcium peroxide
Calcium fluoride	= Calcium fluoride
Calcium hydroxide	= Calcium hydroxide
Calcium hypochlorite	= Calcium hypochlorite
Calcium nitrate tetrahydrate	= Calcium nitrate
Calcium nitrate	= Calcium nitrate
Calcium oxide	= Calcium oxide
Calcium peroxide	= Calcium peroxide
Calcium phosphate	= Calcium phosphate
Calcium phosphide	= Calcium phosphide
Calcium pyrophosphate	= Calcium phosphate
Calcium resinate, fused	= Calcium resinate
Calcium resinate	= Calcium resinate
Calcium rosin	= Calcium resinate
Calcium superphosphate	= Calcium phosphate
Calcium	= Calcium
Calochlor	= Mercuric chloride
Calomel	= Mercurous chloride
Camphene	= Camphene
Camphor oil	= Camphor oil

SYNONYM	COMPOUND NAMES
Cane sugar	= Sucrose
Capraldehyde	= Decaldehyde
n-Capric acid	= Decanoic acid
Capric alcohol	= n-Decyl alcohol
Capric aldehyde	= Decaldehyde
Caprinic acid	= Decanoic acid
Caproaldehyde	= n-Hexaldehyde
n-Caproic acid	= Hexanoic acid
epsilon-Caprolactam	= Caprolactam
Caprolactam	= Caprolactam
Capronaldehyde	= n-Hexaldehyde
Capronic acid	= Hexanoic acid
Capronic aldehyde	= n-Hexaldehyde
n-Caproylaldehyde	= n-Hexaldehyde
Caprylene	= 1-Octene
n-Caprylic acid	= Octanoic acid
Captan	= Captan
Carbamaldehyde	= Formamide
Carbamic acid, ammonium salt	= Ammonium carbamate
Carbamide peroxide	= Urea peroxide
Carbamide	= Urea
Carbaryl	= Carbaryl
Carbide	= Calcium carbide
Carbitol	= Diethylene glycol monoethyl ether
Carbobenzoxyl chloride	= Benzyl chloroformate
Carbofuran	= Carbofuran
Carbolic acid	= Carbolic oil (mixture)
Carbolic acid	= Phenol
Carbolic oil (mixture)	= Carbolic oil (mixture)
Carbon bisulfide	= Carbon disulfide
Carbon dioxide	= Carbon dioxide
Carbon disulfide	= Carbon disulfide
Carbon monoxide	= Carbon monoxide
Carbon oxyfluoride	= Carbon oxyfluoride
Carbon tet	= Carbon tetrachloride
Carbon tetrachloride	= Carbon tetrachloride
Carbonic acid gas	= Carbon dioxide
Carbonic acid, diethyl ester	= Diethyl carbonate
Carbonic acid, monoammonium salt	= Ammonium bicarbonate
Carbonic acid, thallium (1+) salt	= Thallium carbonate
Carbonic anhydride	= Carbon dioxide
Carbonic difluoride	= Carbon oxyfluoride
Carbonochloridic acid, butyl ester	= n-Butyl chloroformate
Carbonyl chloride	= Phosgene
Carbonyl diamine peroxide	= Urea peroxide
Carbonyl difluoride	= Carbon oxyfluoride
Carbonyl fluoride	= Carbon oxyfluoride
Carbonyldiamide	= Urea
Carboxylbenzene	= Benzoic acid
Carene	= Carene
3-Carene	= Carene
Carolid AL	= Diphenyl
Carpeting medium	= Asphalt blending stocks: straight run residue

SYNONYM	COMPOUND NAMES
Carthamus tinctorius oil	= Oils, edible: safflower
Carwinate 125 M	= Diphenylmethane diisocyanate
Cashew nutshell liquid	= Oil, misc: cashew nut shell
Cashew nutshell oil	= Oil, misc: cashew nut shell
Casoron	= Dichlobenil
Catalyst 9915	= Benzyl dimethylamine
Catechin	= Catechol
Catechol	= Catechol
Caustic arsenic chloride	= Arsenic trichloride
Caustic potash solution	= Caustic potash solution
Caustic potash	= Potassium hydroxide
Caustic soda solution	= Caustic soda solution
Caustic soda	= Sodium hydroxide
Cellosolve acetate	= 2-Ethoxyethyl acetate
Cellosolve acetate	= Ethylene glycol monoethyl ether acetate
Cellosolve	= 2-Ethoxyethanol
Cellosolve	= Ethylene glycol monoethyl ether
Cellulose nitrate solution	= Collodion
Cetyl sodium sulfate	= Hexadecyl sulfate, sodium salt
Cetyltrimethylammonium chloride solution	= Hexadecyltrimethylammonium chloride
CGA24705	= Metolachlor
Chaloxyd MEKP-ha 1, -la 1	= 2-Butanone peroxide
Chamber acid	= Sulfuric acid
Charcoal	= Charcoal
Chem bam	= Nabam
Chile saltpeter	= Sodium nitrate
Chinese red	= Mercuric sulfide
Chinese tannin	= Tannic acid
Chinese tannin	= Tannic acid
Chinoline	= Quinoline
Chloracetic acid	= Chloroacetic acid
Chloracetic acid	= Chloroacetic acid (80% or less)
Chloracetyl chloride	= Chloroacetyl chloride
Chloral	= Trichloroacetaldehyde
Chlorate of potash	= Potassium chlorate
Chlorate of potassium	= Potassium chlorate
Chlorate of soda	= Sodium chlorate
Chlorate of soda	= Sodium chlorate solution
Chlorbenzal	= Benzal chloride
Chlordan	= Chlordane
Chlordane	= Chlordane
Chlordecone	= Kepone
2-Chlorethanol	= Ethylene chlorohydrin
Chlorethylene	= Vinyl chloride
Chlorex	= 2,2-Dichloroethyl ether
Chloride of amyl	= n-Amyl chloride
Chlorinated biphenyl	= Polychlorinated biphenyl
Chlorinated hydrochloric ether	= 1,1-Dichloroethane
Chlorine trifluoride	= Chlorine trifluoride
Chlorine	= Chlorine
2-Chloro-1-ethanal	= Chloroacetaldehyde
2-Chloro-1-hydroxybenzene	= o-Chlorophenol
3-Chloro-1-methylbenzene	= m-Chlorotoluene

SYNONYM	COMPOUND NAMES
2-Chloro-1-methylbenzene	= o-Chlorotoluene
4-Chloro-1-methylbenzene	= p-Chlorotoluene
1-Chloro-1-nitropropane	= 1-Chloro-1-nitropropane
3-Chloro-1, 2-propylene oxide	= Epichlorohydrin
2-Chloro-1, 3-butadiene	= Chloroprene
1-Chloro-1,1,2,2-tetrafluoroethane	= Monochlorotetrafluoroethane
5-Chloro-2-aminotoluene	= 4-Chloro-o-toluidine
4-Chloro-2-methylaniline	= 4-Chloro-o-toluidine
3-Chloro-2-methylpropene	= Methallyl chloride
1-Chloro-2-nitrobenzene	= o-Chloronitrobenzene
1-Chloro-2,3-epoxypropane	= Epichlorohydrin
1-Chloro-3-methylbenzene	= m-Chlorotoluene
2-Chloro-4-ethylamino-6-	= Atrazine
1-Chloro-4-methylbenzene	= p-Chlorotoluene
4-Chloro-o-toluidine	= 4-Chloro-o-toluidine
Chloroacetaldehyde, monomer	= Chloroacetaldehyde
Chloroacetaldehyde	= Chloroacetaldehyde
Chloroacetic acid (80% or less)	= Chloroacetic acid (80% or less)
Chloroacetic acid, ethyl ester	= Ethyl chloroacetate
Chloroacetic acid, methyl ester	= Methyl chloroacetate
Chloroacetic acid	= Chloroacetic acid
Chloroacetophenone	= Chloroacetophenone
omega-Chloroacetophenone	= Chloroacetophenone
alpha-Chloroacetophenone	= Chloroacetophenone
Chloroacetyl chloride	= Chloroacetyl chloride
2-Chloroallyl chloride	= 2,3-Dichloropropene
p-Chloroaniline	= p-chloroaniline
4-Chloroaniline	= p-chloroaniline
Chlorobenzene	= Chlorobenzene
Bis-(p-Chlorobenzoyl) peroxide	= Di-(p-chlorobenzoyl) peroxide
p-Chlorobenzoyl peroxide	= Di-(p-chlorobenzoyl) peroxide
p,p'-Chlorobenzoyl peroxide	= Di-(p-chlorobenzoyl) peroxide
2-Chlorobuta-1, 3-diene	= Chloroprene
2-Chlorobutadiene	= Chloroprene
1-Chlorobutane	= Butyl chloride
4-Chlorobutyronitrile	= 4-Chlorobutyronitrile
Chlorocarbonic acid, methyl ester	= Methyl chloroformate
Chlorocarbonic acid, n-butyl ester	= n-Butyl chloroformate
Chlorodifluoromethane	= Chlorodifluoromethane
Chloroethanal	= Chloroacetaldehyde
Chloroethane	= Ethyl chloride
Chloroethanoic acid	= Chloroacetic acid (80% or less)
2-Chloroethanol	= Ethylene chlorohydrin
2-Chloroethyl alcohol	= Ethylene chlorohydrin
Bis (2-Chloroethyl) ether	= 2,2-Dichloroethyl ether
Chloroform	= Chloroform
Chloroformic acid dimethylamide	= N,N-Dimethylcarbamoyl chloride
Chloroformic acid, benzyl ester	= Benzyl chloroformate
Chloroformic acid, benzyl ester	= Benzyl chloroformate
Chloroformic acid, ethyl ester	= Ethyl chloroformate
Chloroformic acid, methyl ester	= Methyl chloroformate
Chloroformic acid, n-butyl ester	= n-Butyl chloroformate
Chloroformyl chloride	= Phosgene
Chlorohydrins	= Chlorohydrins

SYNONYM	COMPOUND NAMES
gamma-Chloroisobutylene	= Methallyl chloride
Bis (2-Chloroisopropyl) ether	= 2,2'-Dichloroisopropyl ether
Chloromethane	= Methyl chloride
Chloromethyl methyl ether	= Chloromethyl methyl ether
Chloromethyl phenyl ketone	= Chloroacetophenone
Chloromethyloxirane	= Epichlorohydrin
o-Chloronitrobenzene	= o-Chloronitrobenzene
o-Chlorophenol	= o-Chlorophenol
4-Chlorophenol	= p-Chlorophenol
p-Chlorophenol	= p-Chlorophenol
1,1-Bis(p-Chlorophenyl)-2,2,2-trichloroethanol	= 4,4'-dichloro-alpha-trichloromethyl benzhydrol
4-Chlorophenylamine	= p-chloroaniline
Chlorophos	= Trichlorfon
Chloropicrin	= Chloropicrin
Chloroprene	= Chloroprene
beta-Chloroprene	= Chloroprene
1-Chloropropane	= n-Propyl chloride
3-Chloropropanoic acid	= 3-Chloropropionic acid
3-Chloropropene	= Allyl chloride
2-Chloropropionic acid	= 2-Chloropropionic acid
alpha-Chloropropionic acid	= 2-Chloropropionic acid
beta-Chloropropionic acid	= 3-Chloropropionic acid
3-Chloropropionic acid	= 3-Chloropropionic acid
gamma-Chloropropylene oxide	= Epichlorohydrin
3-Chloropropylene	= Allyl chloride
Chlorosulfonic acid	= Chlorosulfonic acid
Chlorosulfuric acid	= Chlorosulfonic acid
Chlorotetrafluoroethane	= Monochlorotetrafluoroethane
Chlorothene	= Trichloroethane
omega-Chlorotoluene	= Benzyl chloride
alpha-Chlorotoluene	= Benzyl chloride
3-Chlorotoluene	= m-Chlorotoluene
m-Chlorotoluene	= m-Chlorotoluene
2-Chlorotoluene	= o-Chlorotoluene
o-Chlorotoluene	= o-Chlorotoluene
p-Chlorotoluene	= p-Chlorotoluene
4-Chlorotoluene	= p-Chlorotoluene
Chlorotrifluoroethylene	= Trifluorochloroethylene
Chlorotrifluoromethane	= Monochlorotrifluoromethane
Chlorotrimethylsilane	= Trimethylchlorosilane
1-Chlorpentane	= n-Amyl chloride
Chlorpyrifos	= Dursban
Chlorsulfonic acid	= Chlorosulfonic acid
Chlorthepin	= Endosulfan
Chlorylen	= Trichloroethylene
CHP	= Cumene hydroperoxide
Chromic (III) acetate	= Chromic acetate
Chromic acetate	= Chromic acetate
Chromic acid, dilithium salt	= Lithium chromate
Chromic acid, strontium salt (1:1)	= Strontium chromate
Chromic acid	= Chromic anhydride
Chromic anhydride	= Chromic anhydride
Chromic oxide	= Chromic anhydride



SYNONYM	COMPOUND NAMES
Chromic sulfate	= Chromic sulfate
Chromium (VI) dioxychloride	= Chromyl chloride
Chromium acetate	= Chromic acetate
Chromium chloride	= Chromous chloride
Chromium dichloride	= Chromous chloride
Chromium III sulfate	= Chromic sulfate
Chromium lithium oxide	= Lithium chromate
Chromium oxychloride	= Chromyl chloride
Chromium sulfate	= Chromic sulfate
Chromium triacetate	= Chromic acetate
Chromium trioxide	= Chromic anhydride
Chromous chloride	= Chromous chloride
Chromyl chloride	= Chromyl chloride
Cianurina	= Mercuric cyanide
Citric acid, diammonium salt	= Ammonium citrate, dibasic
Citric acid	= Citric acid
Clorox	= Sodium hypochlorite
Clorox	= Sodium hypochlorite solution
Co-ral	= Coumaphos
Coal tar pitch	= Coal tar pitch
Coalite NTP	= Trixylenyl phosphate
Cobalt (II) bromide	= Cobalt bromide (ous)
Cobalt (II) chloride	= Cobalt chloride
Cobalt (II) fluoride	= Cobalt fluoride
Cobalt acetate tetrahydrate	= Cobalt acetate
Cobalt acetate	= Cobalt acetate
Cobalt amino sulfonate	= Cobalt sulfamate
Cobalt bromide (ous)	= Cobalt bromide (ous)
Cobalt chloride	= Cobalt chloride
Cobalt dibromide	= Cobalt bromide (ous)
Cobalt difluoride	= Cobalt fluoride
Cobalt diformate	= Cobalt formate
Cobalt fluoride	= Cobalt fluoride
Cobalt formate	= Cobalt formate
Cobalt nitrate	= Cobalt nitrate
Cobalt sulfamate	= Cobalt sulfamate
Cobalt sulfate	= Cobalt sulfate
Cobalt(II) acetate	= Cobalt acetate
Cobalt(II) nitrate	= Cobalt nitrate
Cobalt(II) sulfate	= Cobalt sulfate
Cobaltous acetate	= Cobalt acetate
Cobaltous bromide	= Cobalt bromide (ous)
Cobaltous chloride dihydrate	= Cobalt chloride
Cobaltous chloride hexahydrate	= Cobalt chloride
Cobaltous chloride	= Cobalt chloride
Cobaltous formate	= Cobalt formate
Cobaltous nitrate hexahydrate	= Cobalt nitrate
Cobaltous nitrate	= Cobalt nitrate
Cobaltous sulfamate	= Cobalt sulfamate
Cobaltous sulfate heptahydrate	= Cobalt sulfate
Coconut butter	= Oils, edible: coconut
Coconut oil	= Oils, edible: coconut
Cocure 26	= Phenylmercuric acetate
Codal	= Metolachlor

SYNONYM	COMPOUND NAMES
Codoil	= Oils, miscellaneous: resin
Codoil	= Oils, miscellaneous: rosin
Collodion	= Collodion
Cologne spirit	= Ethyl alcohol
Colonial spirit	= Methyl alcohol
Columbian spirit	= Methyl alcohol
Combustion improver C-12	= Methylcyclopentadienylmanganese tricarbonyl
Common verdigris	= Copper subacetate
Compound 1080	= Sodium fluoroacetate
Condensed phosphoric acid	= Polyphosphoric acid
Conoco SA 597	= Dodecylbenzenesulfonic acid
Copper acetate	= Copper acetate
Copper acetoarsenite	= Copper acetoarsenite
Copper ammonium sulfate	= Copper sulfate, ammoniated
Copper arsenite	= Copper arsenite
Copper borofluoride solution	= Copper fluoroborate
Copper bromide (ous)	= Copper bromide (ous)
Copper bromide	= Copper bromide
Copper chloride	= Copper chloride
Copper cyanide (ous)	= Copper cyanide (ous)
Copper fluoroborate	= Copper fluoroborate
Copper formate	= Copper formate
Copper glycinate	= Copper glycinate
Copper iodide	= Copper iodide
Copper lactate	= Copper lactate
Copper monobromide	= Copper bromide (ous)
Copper naphthenate	= Copper naphthenate
Copper nitrate	= Copper nitrate
Copper orthoarsenite	= Copper arsenite
Copper oxalate	= Copper oxalate
Copper subacetate	= Copper subacetate
Copper sulfate pentahydrate	= Copper sulfate
Copper sulfate, ammoniated	= Copper sulfate, ammoniated
Copper sulfate	= Copper sulfate
Copper tartrate	= Copper tartrate
Copper(II) fluoborate solution	= Copper fluoroborate
Copperas	= Ferrous sulfate
Copra oil	= Oils, edible: coconut
Corflex 880	= Diisooctyl phthalate
Corn sugar solution	= Dextrose solution
Corn syrup	= Corn syrup
Corrosive mercury chloride	= Mercuric chloride
Cosan PMA-100	= Phenylmercuric acetate
Cotoran multi	= Metolachlor
Coumaphos	= Coumaphos
Crankcase oil	= Oils, miscellaneous: lubricating
Crankcase oil	= Oils, miscellaneous: motor
Creosote (wood)	= Creosote (wood)
Creosote oil	= Creosote, coal tar
Creosote, coal tar	= Creosote, coal tar
Creosote	= Creosote (wood)
Cresol, epoxypropyl ether	= Cresyl glycidyl ether
m-Cresol	= m-Cresol

SYNONYM	COMPOUND NAMES
3-Cresol	= m-Cresol
o-Cresol	= o-Cresol
2-Cresol	= o-Cresol
p-Cresol	= p-Cresol
Cresols	= Cresols
Cresyl glycidyl ether	= Cresyl glycidyl ether
Cresylate spent caustic solution	= Cresylate spent caustic solution
Cresylate spent caustic	= Cresylate spent caustic solution
m-Cresylic acid	= m-Cresol
Cresylic acid	= Xylenol
Cresylic acids	= Cresols
o-Cresylphosphate	= Tricresyl phosphate (>= 1% ortho isomer)
Croplas EH	= Ethyl hexyl tallate
Crotenaldehyde	= Crotonaldehyde
Croton oil	= Oils, miscellaneous: croton
Croton tiglium oil	= Oils, miscellaneous: croton
Crotonaldehyde	= Crotonaldehyde
Crotonic aldehyde	= Crotonaldehyde
Crotonoel	= Oils, miscellaneous: croton
Crude epichlorohydrin	= Chlorohydrins
Crystallized verdigris	= Copper acetate
CTF	= Chlorine trifluoride
CTFE	= Trifluorochloroethylene
Cucumber dust	= Calcium arsenate
Cumene bottoms	= Diisopropylbenzene (all isomers)
Cumene hydroperoxide	= Cumene hydroperoxide
Cumene	= Cumene
Cumol	= Cumene
Cumyl hydroperoxide	= Cumene hydroperoxide
Cuprammonium sulfate	= Copper sulfate, ammoniated
Cupric acetate monohydrate	= Copper acetate
Cupric acetate, basic	= Copper subacetate
Cupric amino acetate	= Copper glycinate
Cupric ammine sulfate	= Copper sulfate, ammoniated
Cupric arsenite	= Copper arsenite
Cupric bromide, anhydrous	= Copper bromide
Cupric chloride dihydrate	= Copper chloride
Cupric diformate	= Copper formate
Cupric fluoborate solution	= Copper fluoroborate
Cupric green	= Copper arsenite
Cupric nitrate trihydrate	= Copper nitrate
Cupric oxalate hemihydrate	= Copper oxalate
Cupric sulfate	= Copper sulfate
Cupricin	= Copper cyanide (ous)
Cupriethylenediamine hydroxide solution	= Cupriethylenediamine solution
Cupriethylenediamine solution	= Cupriethylenediamine solution
Cuprous cyanide	= Copper cyanide (ous)
Cuprous iodide	= Copper iodide
Curaterr	= Carbofuran
Cyanacetic acid	= Cyanoacetic acid
Cyanide of calcium	= Calcium cyanide
Cyanide of zinc	= Zinc cyanide
Cyanide	= Potassium cyanide

SYNONYM	COMPOUND NAMES
Cyanoacetic acid	= Cyanoacetic acid
Cyanoacetoneitrile	= Propanedinitrile
Cyanobenzene	= Benzonitrile
Cyanoethane	= Propionitrile
2-Cyanoethanol	= Ethylene cyanohydrin
Cyanoethylene	= Acrylonitrile
Cyanogas A-dust	= Calcium cyanide
Cyanogas G-fumigant	= Calcium cyanide
Cyanogen bromide	= Cyanogen bromide
Cyanogen chloride	= Cyanogen chloride
Cyanogen	= Cyanogen
Cyanomethane	= Acetonitrile
Cyanopropane	= Butyronitrile
2-Cyanopropene-1	= Methacrylonitrile
Cyclodan	= Endosulfan
1,5,9-Cyclododecatriene	= 1,5,9-Cyclododecatriene
Cycloheptane	= Cycloheptane
2,5-Cyclohexadiene-1,4-dione	= p-Benzoquinone
1,4-Cyclohexadienedione	= p-Benzoquinone
Cyclohexane	= Cyclohexane
Cyclohexanol	= Cyclohexanol
Cyclohexanone peroxide	= Cyclohexanone peroxide
Cyclohexanone	= Cyclohexanone
Cyclohexanyl acetate	= Cyclohexyl acetate
Cyclohexenyltrichlorosilane	= Cyclohexenyltrichlorosilane
2-Cyclohexyl-4,6-dinitrophenol	= 4,6-Dinitro-o-cyclohexyl phenol
Cyclohexyl acetate	= Cyclohexyl acetate
Cyclohexyl alcohol	= Cyclohexanol
Cyclohexyl ethane	= Ethyl cyclohexane
Cyclohexyl ketone	= Cyclohexanone
Cyclohexylamine, n-ethyl	= N-Ethylcyclohexylamine
Cyclohexylamine, n,n-dimethyl	= N,N-Dimethylcyclohexylamine
Cyclohexylamine	= Cyclohexylamine
N-Cyclohexylethylamine	= N-Ethylcyclohexylamine
Cyclohexylmethane	= Methylcyclohexane
Cyclopentane, methyl	= Methyl cyclopentane
Cyclopentane	= Cyclopentane
Cyclopentene	= Cyclopentene
Cyclopropane	= Cyclopropane
p-Cymene	= p-Cymene
Cymol	= p-Cymene
Cythion insecticide	= Malathion
D-D soil fumigant	= Dichloropropene, dichloropropane mixture
2,4-D esters	= 2,4-D esters
D.D. turpentine	= Turpentine
2,4-D	= 2,4-Dichlorophenoxyacetic acid
Dalapon	= 2,2-Dichloropropanoic acid
Dalmation-insect powder	= Pyrethrins
2,6-DBN	= Dichlobenil
DBP	= Dibutyl phthalate
DCEE	= 2,2-Dichloroethyl ether
DCP	= Calcium phosphate
DDD	= DDD

SYNONYM	COMPOUND NAMES
p,p'-DDT	= DDT
DDT	= DDT
DDVP	= Dichlorvos
DE Kalin	= Decahydronaphthalene
DEA	= Diethanolamine
Dead oil	= Creosote, coal tar
DEAE	= N,N-Diethylethanolamine
Deanol	= Dimethylethanolamine
DEC	= Decahydronaphthalene
Decaborane	= Decaborane
Decachloroketone	= Kepone
Decahydronaphthalene	= Decahydronaphthalene
Decaldehyde	= Decaldehyde
Decalin	= Decahydronaphthalene
Decanal	= Decaldehyde
Bicyclo[4.4.0]Decane	= Decahydronaphthalene
n-Decane	= Decane
Decane	= Decane
1-Decanecarboxylic acid	= Undecanoic acid
n-Decanoic acid	= Decanoic acid
Decanoic acid	= Decanoic acid
1-Decanol	= n-Decyl alcohol
alpha-Decene	= 1-Decene
1-Decene	= 1-Decene
Dechlorane	= Mirex
Decyl acrylate, inhibited	= n-Decyl acrylate
Decyl acrylate	= n-Decyl acrylate
n-Decyl acrylate	= n-Decyl acrylate
n-Decyl alcohol	= n-Decyl alcohol
n-Decyl aldehyde	= Decaldehyde
n-Decylbenzene	= n-Decylbenzene
Decylbenzene	= n-Decylbenzene
Decylbenzenesulfonic acid	= Alkyl(C <sub>11</sub> - C <sub>17</sub> )benzenesulfonic acid
n-Decylic acid	= Decanoic acid
Deep lemon yellow	= Strontium chromate
DEG	= Diethylene glycol
DEHP	= Di-(2-ethylhexyl)phthalate
DEHPA	= Di-(2-ethylhexyl)phosphoric acid
Dehydrite	= Magnesium perchlorate
DEK	= Diethyl ketone
Demeton	= Demeton
DEN	= Diethylamine
Denatured alcohol	= Ethyl alcohol
Detergent alkylate #	= Dodecylbenzene
Detergent HD-90	= Dodecyl benzene sulfonic acid, sodium salt
Dexol stump remover	= Potassium nitrate
Dextrone	= Diquat
Dextrose solution	= Dextrose solution
Di-(2-chloroethyl) ether	= 2,2-Dichloroethyl ether
Di-(2-ethylhexyl) adipate	= Di-(2-ethylhexyl) adipate
Di-(2-ethylhexyl) phosphate	= Di-(2-ethylhexyl)phosphoric acid
Di-(2-ethylhexyl) sulfosuccinate, sodium salt	= Dioctyl sodium sulfosuccinate

SYNONYM	COMPOUND NAMES
Di-(2-ethylhexyl)phosphoric acid	= Di-(2-ethylhexyl)phosphoric acid
Di-(2-ethylhexyl)phthalate	= Di-(2-ethylhexyl)phthalate
Di-(4-chlorobenzoyl) peroxide	= Di-(p-chlorobenzoyl) peroxide
Di-(6-methylheptyl) phthalate	= Diisooctyl phthalate
Di-(p-chlorobenzoyl) peroxide	= Di-(p-chlorobenzoyl) peroxide
Di-(p-chlorophenyl) trichloromethylcarbinol	= 4,4'-dichloro-alpha-trichloromethyl benzhydrol
Di-beta-hydroxyethoxyethane	= Triethylene glycol
Di-n-amyl phthalate	= Di-n-amyl phthalate
Di-n-butyl ether	= Di-n-butyl ether
Di-n-butyl ketone	= Di-n-butyl ketone
Di-n-butylamine	= Di-n-butylamine
Di-n-hexyl adipate	= Di-n-hexyl adipate
Di-n-nonyl phthalate	= Dinonyl phthalate
Di-n-propyl ether	= n-Propyl ether
Di-n-propylamine	= Di-n-propylamine
Di-on	= Diuron
Di-sec-octyl phthalate	= Di-(2-ethylhexyl)phthalate
Di-syston	= Disulfoton
2,6-Di-tert-butylphenol	= Dibutylphenol
Di (2-ethylhexyl) adipate	= Dioctyl adipate
Di (2-ethylhexyl) phthalate	= Dioctyl phthalate
Di(2-hydroxyethyl) amine	= Diethanolamine
Di(7-methyloctyl) phthalate	= Diisononyl phthalate
Di(ethylene oxide)	= 1,4-Dioxane
Diacetic ether	= Ethyl acetoacetate
Diacetone alcohol	= Diacetone alcohol
Diacetone	= Diacetone alcohol
Diacetyl peroxide solution	= Acetyl peroxide solution
Diacetylmethane	= Acetylacetone
1,6-Diamino-2,2,4(or2,4,4)- trimethylhexane	= Trimethyl hexamethylene diamine
1,11-Diamino-3,6,9-triazaundecane	= Tetraethylenepentamine
p,p'-Diaminobiphenyl	= Benzidine
2,2'-Diaminodiethylamine	= Diethylenetriamine
p-Diaminodiphenyl	= Benzidine
1,2-Diaminoethane	= Ethylenediamine
1,2-Diaminoethane	= Ethylenediamine
1,6-Diaminohexane	= Hexamethylenediamine
2,4-Diaminotoluene	= Toluenediamine
Diammonium chromate	= Ammonium chromate
Diammonium citrate	= Ammonium citrate, dibasic
Diammonium hydrogen phosphate	= Ammonium phosphate
Diammonium orthophosphate	= Ammonium phosphate
Diammonium oxalate	= Ammonium oxalate
Diammonium salt of zinc EDTA	= Diammonium salt of zinc EDTA
Diamyl phthalate	= Amyl phthalate
Diamyl phthalate	= Di-n-amyl phthalate
Diantimony trioxide	= Antimony trioxide
Diazinon	= Diazinon
Dibenzo [b,e] pyridine	= Acridine
Dibenzol dipropylene glycol ester	= Dipropylene glycol dibenzoate
Dibenzoyl peroxide	= Dibenzoyl peroxide
Dibenzyl ether	= Dibenzyl ether

SYNONYM	COMPOUND NAMES
DIBK	= Diisobutyl ketone
Dibrom	= Naled
1,2-Dibromo-2,2-dichloroethyl dimethyl phosphate	= Naled
1,2-Dibromoethane	= Ethylene dibromide
sym-Dibromoethane	= Ethylene dibromide
Dibromomethane	= Dibromomethane
1,2-Dibutoxyethane	= Ethylene glycol dibutyl ether
2,2'-Dibutoxyethyl ether	= Diethylene glycol dibutyl ether
Dibutyl carbitol	= Diethylene glycol dibutyl ether
Dibutyl cellosolve	= Ethylene glycol dibutyl ether
n-Dibutyl ether	= Di-n-butyl ether
Dibutyl ether	= Di-n-butyl ether
Dibutyl oxide	= Di-n-butyl ether
Dibutyl phthalate	= Dibutyl phthalate
Dibutylamine	= Di-n-butylamine
Dibutylphenol	= Dibutylphenol
Dicalcium phosphate	= Calcium phosphate
Dicamba	= Dicamba
Dicarbomethoxyzinc	= Zinc acetate
Dichlobenil	= Dichlobenil
Dichlone	= Dichlone
Dichlorfendism	= Diuron
Dichloricide	= p-Dichlorobenzene
1,1-Dichloro-1-nitroethane	= 1,1-Dichloro-1-nitroethane
2,3-Dichloro-1-propane	= 2,3-Dichloropropene
2,3-Dichloro-1,4-naphthoquinone	= Dichlone
cis-1,4-Dichloro-2-butene	= Dichlorobutene
trans-1,4-Dichloro-2-butene	= Dichlorobutene
1,4-Dichloro-2-butene	= Dichlorobutene
1,4-Dichloro-2-butylene	= Dichlorobutene
1,1-Dichloro-2,2-bis(p-chlorophenyl) ethane	= DDD
4,4'-Dichloro-alpha-trichloromethyl benzhydrol	= 4,4'-Dichloro-alpha-trichloromethyl benzhydrol
3,6-Dichloro-o-anisic acid	= Dicamba
Dichloroacetic acid, methyl ester	= Methyl dichloroacetate
meta-Dichlorobenzene	= m-Dichlorobenzene
m-Dichlorobenzene	= m-Dichlorobenzene
1,3-Dichlorobenzene	= m-Dichlorobenzene
o-Dichlorobenzene	= o-Dichlorobenzene
ortho-Dichlorobenzene	= o-Dichlorobenzene
1,2-Dichlorobenzene	= o-Dichlorobenzene
p-Dichlorobenzene	= p-Dichlorobenzene
2,6-Dichlorobenzonitrile	= Dichlobenil
p,p'-Dichlorobenzoyl peroxide	= Di-(p-chlorobenzoyl) peroxide
Dichlorobutene	= Dichlorobutene
Dichlorodiethyl ether	= 2,2-Dichloroethyl ether
Dichlorodifluoromethane	= Dichlorodifluoromethane
Dichlorodiphenyldichloroethane	= DDD
Dichlorodiphenylsilane	= Diphenyldichlorosilane
Dichlorodiphenylsilane	= Diphenyldichlorosilane
Dichlorodiphenyltrichloroethane	= DDT
1,1-Dichloroethane	= 1,1-Dichloroethane

SYNONYM	COMPOUND NAMES
1,2-Dichloroethane	= Ethylene dichloride
Dichloroether	= 2,2-Dichloroethyl ether
2,2-Dichloroethyl ether	= 2,2-Dichloroethyl ether
trans-1,2-Dichloroethylene	= 1,2-Dichloroethylene
sym-Dichloroethylene	= 1,2-Dichloroethylene
cis-1,2-Dichloroethylene	= 1,2-Dichloroethylene
1,2-Dichloroethylene	= 1,2-Dichloroethylene
1,1-Dichloroethylene	= Vinylidene chloride
unsym-Dichloroethylene	= Vinylidene chloride
Dichlorofluoromethane	= Dichloromonofluoromethane
1,6-Dichlorohexane	= 1,6-Dichlorohexane
2,2'-Dichloroisopropyl ether	= 2,2'-Dichloroisopropyl ether
2,2'-Dichloroisopropyl ether	= 2,2'-Dichloroisopropyl ether
Dichloromethane	= Dichloromethane
Dichloromonofluoromethane	= Dichloromonofluoromethane
2,4-Dichlorophenol	= 2,4-Dichlorophenol
2,4-Dichlorophenoxyacetic acid, butoxyethyl ester	= 2,4-D esters
2,4-Dichlorophenoxyacetic acid	= 2,4-Dichlorophenoxyacetic acid
Dichlorophenylphosphine	= Benzene phosphorus dichloride
Dichlorophos	= Dichlorvos
1,1-Dichloropropane	= 1,1-Dichloropropane
1,2-Dichloropropane	= 1,2-Dichloropropane
Dichloropropane	= 1,2-Dichloropropane
1,3-Dichloropropane	= 1,3-Dichloropropane
2,2-Dichloropropanoic acid	= 2,2-Dichloropropanoic acid
1,3-Dichloropropene and 1,2- Dichloropropane	= Dichloropropene, dichloropropane mixture
Dichloropropene, dichloropropane mixture	= Dichloropropene, dichloropropane mixture
1,3-Dichloropropene	= 1,3-Dichloropropene
Dichloropropene	= 1,3-Dichloropropene
2,3-Dichloropropene	= 2,3-Dichloropropene
2,2-Dichloropropionic acid	= 2,2-Dichloropropanoic acid
2,3-Dichloropropylene	= 2,3-Dichloropropene
Dichlorotetrafluoroethane	= Dichlorotetrafluoroethane
1,2-Dichlorotetrafluoroethane	= Dichlorotetrafluoroethane
2,2-Dichlorovinyl O,O-dimethyl phosphate	= Dichlorvos
Dichlorvos	= Dichlorvos
Dichromium sulfate	= Chromic sulfate
Dichromium trisulfate	= Chromic sulfate
Dicofol	= 4,4'-Dichloro-alpha-trichloromethyl benzhydrol
Dicy	= Dicyclopentadiene
Dicyan	= Cyanogen
1,4-Dicyanobutane	= Adiponitrile
Dicyanogen	= Cyanogen
Dicyclohexanone diperoxide	= Cyclohexanone peroxide
Dicyclopentadiene	= Dicyclopentadiene
Dieldrin	= Dieldrin
Diesel ignition improver	= n-Amyl nitrate
Diesel oil (light)	= Oils, fuel: 1-D
Diesel oil, medium	= Oils, fuel: 2-D



SYNONYM	COMPOUND NAMES
Diethanolamine lauryl sulfate solution	= Dodecyl sulfate, diethanolamine salt
Diethanolamine	= Diethanolamine
Diethion	= Ethion
1,1-Diethoxyethane	= Acetal
1,2-Diethoxyethane	= Ethylene glycol diethyl ether
O,O-Diethyl-5-2-(ethylthio)ethyl phosphodithioate	= Disulfoton
O,O-Diethyl-O-(3-chloro-4-methyl-2-oxo- (2h)-1-benzopyran-7-yl) phosphorothioate	= Coumaphos
Diethyl "cellosolve"	= Ethylene glycol diethyl ether
Diethyl acetal	= Acetal
Diethyl carbonate	= Diethyl carbonate
Diethyl ether	= Ethyl ether
Diethyl ketone	= Diethyl ketone
O,O-Diethyl O-(2-isopropyl-6-methyl-4- pyrimidinyl)phosphorothioate	= Diazinon
Diethyl oxide	= Ethyl ether
Diethyl phthalate	= Diethyl phthalate
Diethyl sulfate	= Diethyl sulfate
Diethyl sulphate	= Diethyl sulfate
Diethylamine	= Diethylamine
2-N-Diethylaminoethanol	= N,N-Diethylethanolamine
Diethylaminoethanol	= N,N-Diethylethanolamine
2,6-Diethylaniline	= 2,6-Diethylaniline
Diethylbenzene	= Diethylbenzene
Diethylene glycol di-n-butyl ether	= Diethylene glycol dibutyl ether
Diethylene glycol dibutyl ether	= Diethylene glycol dibutyl ether
Diethylene glycol dimethyl ether	= Diethylene glycol dimethyl ether
Diethylene glycol ethyl ether acetate	= Diethylene glycol ethyl ether acetate
Diethylene glycol ethyl ether	= Diethylene glycol monoethyl ether
Diethylene glycol methyl ether acetate	= Diethylene glycol methyl ether acetate
Diethylene glycol methyl ether	= Diethylene glycol monomethyl ether
Diethylene glycol monobutyl ether acetate	= Diethylene glycol monobutyl ether acetate
Diethylene glycol monobutyl ether	= Diethylene glycol monobutyl ether
Diethylene glycol monoethyl ether	= Diethylene glycol monoethyl ether
Diethylene glycol monomethyl ether	= Diethylene glycol monomethyl ether
Diethylene glycol n-hexyl ether	= Diethylene glycol n-hexyl ether
Diethylene glycol phthalate	= Diethylene glycol phthalate
Diethylene glycol	= Diethylene glycol
Diethylene imidoxide	= Morpholine
Diethylene oxide	= Tetrahydrofuran
Diethylene oximide	= Morpholine
Diethylenediamine	= Piperazine
Diethyleneimide oxide	= Morpholine
Diethylenetriamine	= Diethylenetriamine
N,N-Diethylethanolamine	= N,N-Diethylethanolamine
Diethylzinc	= Diethylzinc
Dieyanomethane	= Propanedinitrile
1,1-Difluoroethane	= 1,1-Difluoroethane
Difluorophosphoric acid	= Difluorophosphoric acid
Difluorophosphorus acid	= Difluorophosphoric acid
Diformyl	= Glyoxal

SYNONYM	COMPOUND NAMES
Diglycidyl ether of Bisphenol A	= Bisphenol A diglycidyl ether
Diglycol monobutyl ether acetate	= Diethylene glycol monobutyl ether acetate
Diglycol monobutyl ether	= Diethylene glycol monobutyl ether
Diglycol	= Diethylene glycol
Diglyme	= Diethylene glycol dimethyl ether
Diheptyl phthalate	= Diheptyl phthalate
1,2-Dihydro-3,6-pyridazinedione	= Maleic hydrazide
2,5-Dihydroperoxy-2,5-dimethylhexane	= Dimethylhexane dihydroperoxide
1,4-Dihydroxy-2-butene	= 1,4-Butenediol
1,4-Dihydroxy-2-butyne	= 1,4-Butynediol
2,2-Dihydroxy-3,3,5,5,6,6-hexachlorodiphenylmethane	= Hexachlorophene
1,2-Dihydroxybenzene	= Catechol
p-Dihydroxybenzene	= Hydroquinone
1,3-Dihydroxybenzene	= Resorcinol
m-Dihydroxybenzene	= Resorcinol
Dihydroxybenzol	= Resorcinol
1,4-Dihydroxybutane	= 1,4-Butanediol
Dihydroxybutane	= Butylene glycol
2,2'-Dihydroxydiethyl amine	= Diethanolamine
p,p'-Dihydroxydiphenyldimethylmethane	= Bisphenol A
2,2'-Dihydroxydipropylamine	= Diisopropanolamine
1,2-Dihydroxyethane	= Ethylene glycol
1,2-Dihydroxypropane	= Propylene glycol
Diisobutyl ketone	= Diisobutyl ketone
Diisobutyl phthalate	= Diisobutyl phthalate
Diisobutylamine	= Diisobutylamine
Diisobutylcarbinol	= Diisobutylcarbinol
Diisobutylene	= Diisobutylene
Diisodecyl phthalate	= Diisodecyl phthalate
Diisononyl adipate	= Diisononyl adipate
Diisononyl phthalate	= Diisononyl phthalate
Diisooctyl phthalate	= Diisooctyl phthalate
Diisopropanolamine	= Diisopropanolamine
Diisopropyl ether	= Isopropyl ether
Diisopropyl naphthalene	= Diisopropyl naphthalene
2,6-Diisopropyl naphthalene	= Diisopropyl naphthalene
Diisopropyl oxide	= Isopropyl ether
Diisopropyl percarbonate	= Isopropyl percarbonate
Diisopropyl peroxydicarbonate	= Isopropyl percarbonate
5-Diisopropylacetone	= Diisobutyl ketone
Diisopropylamine	= Diisopropylamine
Diisopropylbenzene (all isomers)	= Diisopropylbenzene (all isomers)
Diisopropylbenzene hydroperoxide	= Diisopropylbenzene hydroperoxide
Dilauroyl peroxide	= Lauroyl peroxide
Dilithium chromate	= Lithium chromate
Dilute sulfuric acid	= Sulfuric acid, spent
Dimazine	= 1,1-Dimethylhydrazine
1,2-Dimethoxyethane	= Ethylene glycol dimethyl ether
Dimethoxymethane	= Methyl formal
10,11-Dimethoxystrychnine	= Brucine
Dimethyl-1-hexanols	= Isooctyl alcohol
3,3-Dimethyl-2-methylene norcamphane	= Camphene

SYNONYM	COMPOUND NAMES
2,2-Dimethyl-3-methylene norborane	= Camphene
2,6-Dimethyl-4-heptane	= Diisobutyl ketone
2,6-Dimethyl-4-heptanol	= Diisobutylcarbinol
N,N-Dimethyl-n-(2-hydroxyethyl) amine	= Dimethylethanolamine
alpha, alpha-Dimethyl-propionic acid	= Trimethylacetic acid
N,N-Dimethyl acetamide solution (40% or less)	= N,N-Dimethyl acetamide solution (40% or less)
Dimethyl acetone	= Diethyl ketone
Dimethyl adipate	= Dimethyl adipate
N,N-Dimethyl benzene methanamine	= Benzyl dimethylamine
N,N-Dimethyl benzylamine	= Benzyl dimethylamine
Dimethyl carbamic chloride	= N,N-Dimethylcarbamoyl chloride
Dimethyl cellosolve	= Ethylene glycol dimethyl ether
Dimethyl ether	= Dimethyl ether
Dimethyl formal	= Methyl formal
Dimethyl glutarate	= Dimethyl glutarate
Dimethyl hexanedioate	= Dimethyl adipate
Dimethyl hydrogen phosphite	= Dimethyl hydrogen phosphite
Dimethyl ketone	= Acetone
O,O-Dimethyl o-p-nitrophenyl thiophosphate	= Methyl parathion
2,2-Dimethyl octanoic acid	= Neodecanoic acid
Dimethyl phosphite	= Dimethyl hydrogen phosphite
Dimethyl phthalate	= Dimethyl phthalate
O,O-Dimethyl s-[(4-oxo-1,2,3-benzotriazine-3-(4h)-yl)methyl]phosphorodithioate	= Azinphos methyl
Dimethyl silicone fluids	= Dimethylpolysiloxane
Dimethyl silicone oil	= Dimethylpolysiloxane
Dimethyl succinate	= Dimethyl succinate
Dimethyl sulfate	= Dimethyl sulfate
Dimethyl sulfide	= Dimethyl sulfide
Dimethyl sulfoxide	= Dimethyl sulfoxide
Dimethyl terephthalate	= Dimethyl terephthalate
N,N-(Dimethyl) a-tolueneamine	= Benzyl dimethylamine
N,N-Dimethylacetamide	= Dimethylacetamide
Dimethylacetamide	= Dimethylacetamide
Dimethylacetamide	= N,N-Dimethyl acetamide solution (40% or less)
Dimethylacetic acid	= Isobutyric acid
Dimethylacetylenecarbinol	= 2-Methyl-2-hydroxy-3-butyne
Dimethylamine	= Dimethylamine
2-(Dimethylamino)ethanol	= Dimethylethanolamine
a-(Dimethylamino)toluene	= Benzyl dimethylamine
B-Dimethylaminoethyl alcohol	= Dimethylethanolamine
2,6-Dimethylaniline	= 2,6-Dimethylaniline
Dimethylarsinic acid	= Cacodylic acid
alpha, alpha-Dimethylbenzene hydroperoxide	= Cumene hydroperoxide
1,3-Dimethylbenzene	= m-Xylene
1,2-Dimethylbenzene	= o-Xylene
1,4-Dimethylbenzene	= p-Xylene
Dimethylbenzyl hydroperoxide	= Cumene hydroperoxide
2,2-Dimethylbutane	= Neohexane

SYNONYM	COMPOUND NAMES
2,2-Dimethylcaprylic acid	= 2,2-Dimethyloctanoic acid
N,N-Dimethylcarbamoyl chloride	= N,N-Dimethylcarbamoyl chloride
Dimethylcarbamylochloride	= N,N-Dimethylcarbamoyl chloride
Dimethylcarbinol	= Isopropyl alcohol
N,N-Dimethylchloroformamide	= N,N-Dimethylcarbamoyl chloride
n-Dimethylcyclohexanamine	= N,N-Dimethylcyclohexylamine
N,N-Dimethylcyclohexylamine	= N,N-Dimethylcyclohexylamine
Dimethyldichlorosilane	= Dimethyldichlorosilane
Dimethylethanolamine	= Dimethylethanolamine
1,1-Dimethylethylamine	= tert-Butylamine
Dimethylethynylcarbinol	= 2-Methyl-2-hydroxy-3-butyne
N,N-Dimethylformamide	= Dimethylformamide
Dimethylformamide	= Dimethylformamide
Dimethylhexanals	= Isooctaldehyde
2,5-Dimethylhexane-2,5-dihydroperoxide	= Dimethylhexane dihydroperoxide
Dimethylhexane dihydroperoxide	= Dimethylhexane dihydroperoxide
1,1-Dimethylhydrazine	= 1,1-Dimethylhydrazine
unsym-Dimethylhydrazine	= 1,1-Dimethylhydrazine
sym-Dimethylhydrazine	= 1,2-Dimethylhydrazine
1,2-Dimethylhydrazine	= 1,2-Dimethylhydrazine
Dimethylmethane	= Propane
2,2-Dimethyloctanoic acid	= 2,2-Dimethyloctanoic acid
Dimethylol propane	= 2,2-Dimethylpropane-1,3-diol
Dimethylphenol phosphate (3:1)	= Trixylenyl phosphate
Dimethylphenol	= Xylenol
Dimethylphosphonate	= Dimethyl hydrogen phosphite
Dimethylpolysiloxane	= Dimethylpolysiloxane
2,2-Dimethylpropane-1,3-diol	= 2,2-Dimethylpropane-1,3-diol
1,1-Dimethylpropargyl alcohol	= 2-Methyl-2-hydroxy-3-butyne
Bis(Dimethylthiocarbamyl)disulfide	= Thiram
Dimethyltrimethylene glycol	= 2,2-Dimethylpropane-1,3-diol
Dimethylzinc	= Dimethylzinc
2,4-Dinitraniline	= 2,4-Dinitroaniline
2,4-Dinitro-6-cyclohexylphenol	= 4,6-Dinitro-o-cyclohexyl phenol
2,6-Dinitro-n,n-dipropyl-4-trifluoromethylaniline	= Trifluralin
3,5-Dinitro-o-cresol	= Dinitrocresol
2,6-Dinitro-o-cresol	= Dinitrocresol
4,6-Dinitro-o-cresol	= Dinitrocresol
4,6-Dinitro-o-cyclohexyl phenol	= 4,6-Dinitro-o-cyclohexyl phenol
Dinitro-o-cyclohexylphenol	= 4,6-Dinitro-o-cyclohexyl phenol
2,4-Dinitroaniline	= 2,4-Dinitroaniline
m-Dinitrobenzene	= m-Dinitrobenzene
1,3-Dinitrobenzene	= m-Dinitrobenzene
meta-Dinitrobenzene	= m-Dinitrobenzene
o-Dinitrobenzene	= o-Dinitrobenzene
1,2-Dinitrobenzene	= o-Dinitrobenzene
1,4-Dinitrobenzene	= p-Dinitrobenzene
p-Dinitrobenzene	= p-Dinitrobenzene
1,3-Dinitrobenzol	= m-Dinitrobenzene
Dinitrobenzol	= m-Dinitrobenzene
o-Dinitrobenzol	= o-Dinitrobenzene
Dinitrocresol	= Dinitrocresol
Dinitrogen monoxide	= Nitrous oxide

SYNONYM	COMPOUND NAMES
Dinitrogen tetroxide	= Nitrogen tetroxide
2,4-Dinitrophenol	= 2,4-Dinitrophenol
alpha-Dinitrophenol	= 2,4-Dinitrophenol
2,5-Dinitrophenol	= 2,5-Dinitrophenol
gamma-Dinitrophenol	= 2,5-Dinitrophenol
beta-Dinitrophenol	= 2,6-Dinitrophenol
2,6-Dinitrophenol	= 2,6-Dinitrophenol
o-o-Dinitrophenol	= 2,6-Dinitrophenol
2,4-Dinitrotoluene	= 2,4-Dinitrotoluene
2,6-Dinitrotoluene	= 2,6-Dinitrotoluene
3,4-Dinitrotoluene	= 3,4-Dinitrotoluene
2,4-Dinitrotoluol	= 2,4-Dinitrotoluene
Dinonyl 1,2-benzenedicarboxylate	= Dinonyl phthalate
Dinonyl phthalate	= Dinonyl phthalate
Diocetyl adipate	= Diocetyl adipate
Diocetyl phthalate	= Diocetyl phthalate
Diocetyl sodium sulfosuccinate	= Diocetyl sodium sulfosuccinate
Dioform	= 1,2-Dichloroethylene
Dioxane	= 1,4-Dioxane
p-Dioxane	= 1,4-Dioxane
1,4-Dioxane	= 1,4-Dioxane
Dioxonium perchlorate solution	= Perchloric acid
1,3-Dioxophthalan	= Phthalic anhydride
DIPB	= Diisopropylbenzene (all isomers)
Dipentene	= Dipentene
Dipentyl phthalate	= Amyl phthalate
Dipentyl phthalate	= Di-n-amyl phthalate
Diphenyl-diphenyl ether mixture	= Dowtherm
Diphenyl ether	= Diphenyl ether
Diphenyl ketone	= Benzophenone
Diphenyl methanone	= Benzophenone
Diphenyl oxide	= Diphenyl ether
Diphenyl	= Diphenyl
Diphenylamine	= Diphenylamine
Diphenyldichlorosilane	= Diphenyldichlorosilane
Diphenylmethane-4,4'-diisocyanate	= Diphenylmethane diisocyanate
Diphenylmethane diisocyanate	= Diphenylmethane diisocyanate
Diphenylsilicon dichloride	= Diphenyldichlorosilane
Dipropenediol dibenzoate	= Dipropylene glycol dibenzoate
Dipropyl ether	= n-Propyl ether
N,N-Dipropylaniline	= Nitralin
Dipropylene glycol dibenzoate	= Dipropylene glycol dibenzoate
Dipropylene glycol methyl ether	= Dipropylene glycol methyl ether
Dipropylene glycol monomethyl ether	= Dipropylene glycol methyl ether
Dipropylene glycol	= Dipropylene glycol
Dipterex	= Trichlorfon
Diquat dibromide	= Diquat
Diquat	= Diquat
Disodium arsenate heptahydrate	= Sodium arsenate
Disodium dihydrogen pyrophosphate	= Sodium phosphate
Disodium ethylenebis[dithiocarbamate]	= Nabam
Disodium methane arsonate	= Methanearsonic acid, sodium salt
Disodium methyl arsonate	= Methanearsonic acid, sodium salt
Disodium nitrilotriacetate	= Nitrilotriacetic acid and salts

SYNONYM	COMPOUND NAMES
Disodium selenite	= Sodium selenite
Distillates: flashed feed stocks	= Distillates: flashed feed stocks
Distillates: straight run	= Distillates: straight run
Distokal	= Hexachloroethane
Distopan	= Hexachloroethane
Disulfatozirconic acid	= Zirconium sulfate
Disulfoton	= Disulfoton
Dithallium carbonate	= Thallium carbonate
Dithane	= Nabam
Dithiopyrophosphoric acid, O,O,O,O-tetraethyl ester	= Tetraethyl dithiopyrophosphate
Dithiosystox	= Disulfoton
Ditridecyl phthalate	= Ditridecyl phthalate
Diundecyl phthalate	= Diundecyl phthalate
Diurex	= Diuron
Diuron	= Diuron
Divinyl	= Butadiene
Divinylene oxide	= Furan
divinylmethane	= 1,4-Pentadiene
DMCC	= N,N-Dimethylcarbamoyl chloride
DMDT	= Methoxychlor
DMF	= Dimethylformamide
DMP	= Dimethyl phthalate
DMS	= Dimethyl sulfide
DMSO	= Dimethyl sulfoxide
m-DNB	= m-Dinitrobenzene
2,5-DNP	= 2,5-Dinitrophenol
DNP	= 2,6-Dinitrophenol
DNT	= 2,4-Dinitrotoluene
2,6-DNT	= 2,6-Dinitrotoluene
3,4-DNT	= 3,4-Dinitrotoluene
DO 14	= Propargite
DOA	= Dioctyl adipate
1-Dodecanethiol	= Lauryl mercaptan
n-Dodecanoic acid	= Lauric acid
Dodecanol	= Dodecanol
Dodecanol	= Linear alcohols
Dodecanoyl peroxide	= Lauroyl peroxide
Dodecene (non-linear)	= Dodecene
Dodecene (non-linear)	= Propylene tetramer
1-Dodecene	= 1-Dodecene
Dodecene	= Dodecene
Dodecyl-2-methyl-2-propenoate	= Dodecylmethacrylate
Dodecyl alcohol	= Dodecanol
Dodecyl benzene sulfonic acid, sodium salt	= Dodecyl benzene sulfonic acid, sodium salt
Dodecyl diphenyl ether disulfonate solution	= Dodecyl diphenyl ether disulfonate solution
Dodecyl diphenyl ether sulfonate, disodium salt, aqueous solution	= Dodecyl diphenyl ether disulfonate solution
Dodecyl mercaptan	= Lauryl mercaptan
Dodecyl phenol	= Dodecyl phenol
Dodecyl sulfate, ammonium salt	= Ammonium lauryl sulfate
Dodecyl sulfate, diethanolamine salt	= Dodecyl sulfate, diethanolamine salt

SYNONYM	COMPOUND NAMES
Dodecyl sulfate, magnesium salt	= Dodecyl sulfate, magnesium salt
Dodecyl sulfate, sodium salt	= Dodecyl sulfate, sodium salt
Dodecyl sulfate, triethanolamine salt	= Dodecyl sulfate, triethanolamine salt
Dodecyl/pentadecyl methacrylate	= Dodecyl/pentadecyl methacrylate
Dodecylbenzene	= Dodecylbenzene
n-Dodecylbenzene	= Dodecylbenzene
n-Dodecylbenzene	= Dodecylbenzene
Dodecylbenzenesulfonate sodium salt	= Dodecyl benzene sulfonic acid, sodium salt
Dodecylbenzenesulfonic acid, calcium salt	= Dodecylbenzenesulfonic acid, calcium salt
Dodecylbenzenesulfonic acid, isopropylamine salt	= Dodecylbenzenesulfonic acid, isopropylamine salt
Dodecylbenzenesulfonic acid, triethanolamine salt	= Dodecylbenzenesulfonic acid, triethanolamine salt
Dodecylbenzenesulfonic acid	= Dodecylbenzenesulfonic acid
alpha-Dodecylene	= 1-Dodecene
Dodecylethylene	= 1-Tetradecene
Dodecylmethacrylate	= Dodecylmethacrylate
Dodecyltrichlorosilane	= Dodecyltrichlorosilane
DOP	= Dioctyl phthalate
Dormant oil	= Oils, miscellaneous: spray
Dow-fume 40	= Ethylene dibromide
Dowanol-50B	= Dipropylene glycol methyl ether
Dowanol 33B	= Propylene glycol methyl ether
Dowanol DB	= Diethylene glycol monobutyl ether
Dowanol DE	= Diethylene glycol monoethyl ether
Dowanol DM	= Diethylene glycol monomethyl ether
Dowanol DPM	= Dipropylene glycol methyl ether
Dowanol EB	= Ethylene glycol monobutyl ether
Dowanol EE	= 2-Ethoxyethanol
Dowanol EE	= Ethylene glycol monoethyl ether
Dowanol eipat	= Ethylene glycol isopropyl ether
Dowanol EM	= Ethylene glycol monomethyl ether
Dowanol EP	= Ethylene glycol phenyl ether
Dowanol EPH	= Ethylene glycol phenyl ether
Dowanol PM	= Propylene glycol methyl ether
Dowanol TE	= Ethoxy triglycol
Dowanol TPM	= Tripropylene glycol methyl ether
Dowco 179	= Dursban
Dowfax 2A1	= Dodecyl diphenyl ether disulfonate solution
Dowfume N	= Dichloropropene, dichloropropane mixture
Dowicide 2	= Trichlorophenol
Dowicide 7	= Pentachlorophenol
Dowtherm A	= Dowtherm
Dowtherm e	= o-Dichlorobenzene
Dowtherm	= Dowtherm
Dracyclic acid	= Benzoic acid
Dri-tri	= Sodium phosphate, tribasic
Drycleaner naphtha	= Naphtha: stoddard solvent
Drying oil epoxides	= Epoxidized vegetable oils
DSMA	= Methanearsonic acid, sodium salt

SYNONYM	COMPOUND NAMES
DTDP	= Ditridecyl phthalate
Du-sprex	= Dichlobenil
Dual	= Metolachlor
Duodecyllic acid	= Lauric acid
Duodex	= Sodium 2-mercaptobenzothiazol solution
Dursban	= Dursban
Dust-laying oil	= Asphalt blending stocks: roofers flux
Dutch liquid	= Ethylene dichloride
Dylox	= Trichlorfon
Dytol S-91	= n-Decyl alcohol
E3314	= Heptachlor
EAA	= Ethyl acetoacetate
EADC	= Ethylaluminum dichloride
EASC	= Ethylaluminum sesquichloride
EB	= Ethylbenzene
EBDC, sodium salt	= Nabam
Ecrinitrit	= Sodium nitrite
EDC	= Ethylene dichloride
Edible tallow	= Tallow
EDTA-zinc complex	= Diammonium salt of zinc EDTA
EDTA-zinc	= Diammonium salt of zinc EDTA
EDTA zinc salt	= Diammonium salt of zinc EDTA
EDTA	= Ethylenediamine tetracetic acid
Egitol	= Hexachloroethane
Ektasolve DB acetate	= Diethylene glycol monobutyl ether acetate
Ektasolve EP	= Ethylene glycol propyl ether
Electrical insulating oil	= Oils, miscellaneous: transformer
Embafume	= Methyl bromide
Emerald green	= Copper acetoarsenite
Emerssence 1160	= Ethylene glycol phenyl ether
Emery 6705	= Ethylene glycol phenyl ether
Enanthic acid	= Heptanoic acid
Enanthic alcohol	= Heptanol
Endosulfan	= Endosulfan
Endrate	= Ethylenediamine tetracetic acid
Endrin	= Endrin
ENT-16391	= Kepone
ENT 25,719	= Mirex
ENT 262	= Dimethyl phthalate
ENT 27,311	= Dursban
Epichlorohydrin resin	= Bisphenol A diglycidyl ether
Epichlorohydrin	= Epichlorohydrin
Epoxidized drying oils	= Epoxidized vegetable oils
Epoxidized oils	= Epoxidized vegetable oils
Epoxidized tall oil, octyl ester	= Octyl epoxy tallate
Epoxidized vegetable oils	= Epoxidized vegetable oils
1,2-Epoxy-3-butoxy propane	= n-Butyl glycidyl ether
1,2-Epoxybutane	= 1,2-Butylene oxide
1,2-Epoxyethane	= Ethylene oxide
1,2-Epoxypropane	= Propylene oxide
2,3-Epoxypropyl butyl ether	= n-Butyl glycidyl ether
Eriocholcite (anhydrous)	= Copper chloride
Eskimon-22	= Chlorodifluoromethane



SYNONYM	COMPOUND NAMES
Eskimon 11	= Trichlorofluoromethane
Eskimon 12	= Dichlorodifluoromethane
Essence of mirbane	= Nitrobenzene
Essence of Niobe	= Methyl benzoate
Ethanal, trichloro-	= Trichloroacetaldehyde
Ethanal	= Acetaldehyde
Ethane dinitrile	= Cyanogen
Ethane hexachloride	= Hexachloroethane
Ethane pentachloride	= Pentachloroethane
Ethane, 1,1,2-trichloro- 1,2,2-trifluoro-	= 1,1,2-Trichloro-1,2,2-trifluoroethane
Ethane, 1,1,2-trichloro-	= 1,1,2-Trichloroethane
Ethane, 1,2-dibutoxy	= Ethylene glycol dibutyl ether
Ethane, pentachloro-	= Pentachloroethane
Ethane	= Ethane
Ethancarboxylic acid	= Propionic acid
Ethanedial	= Glyoxal
1,2-Ethanediamine	= Ethylenediamine
1,2-Ethanediamine	= Ethylenediamine
Ethanedioic acid, disodium salt	= Sodium oxalate
Ethanedioic acid	= Oxalic acid
1,2-Ethanediol, monoacetate	= Ethylene glycol acetate
1,2-Ethanediol	= Ethylene glycol
Ethanenitrile	= Acetonitrile
Ethanethiol	= Ethyl mercaptan
Ethanoic acid	= Acetic acid
Ethanoic anhydride	= Acetic anhydride
Ethanol, 2-isopropoxy	= Ethylene glycol isopropyl ether
Ethanol	= Ethyl alcohol
Ethanolamine	= Monoethanolamine
Ethanoyl chloride	= Acetyl chloride
Ethene	= Ethylene
Ether cyanatus	= Propionitrile
Ether ethylene glycol dibutyl	= Ethylene glycol dibutyl ether
Ether, bis(2-chloro-1-methylethyl)	= 2,2'-Dichloroisopropyl ether
Ether, hydrochloric	= Ethyl chloride
Ether, vinyl ethyl	= Vinyl ethyl ether
Ether	= Ethyl ether
Ethine	= Acetylene
Ethion	= Ethion
Ethiops mineral	= Mercuric sulfide
1-Ethoxy-2-propanol	= Propylene glycol ethyl ether
2-Ethoxy-3,4-dihydro-2h-pyran	= Ethoxydihdropyran
Ethoxy diglycol	= Diethylene glycol monoethyl ether
Ethoxy propionic acid, ethyl ester	= Ethyl-3-ethoxypropionate
Ethoxy triglycol	= Ethoxy triglycol
Ethoxydihdropyran	= Ethoxydihdropyran
Ethoxyethane	= Ethyl ether
2-Ethoxyethanol	= 2-Ethoxyethanol
2-Ethoxyethanol	= Ethylene glycol monoethyl ether
2-(2-Ethoxyethoxy) ethanol	= Diethylene glycol monoethyl ether
2-Ethoxyethyl acetate	= 2-Ethoxyethyl acetate
2-Ethoxyethyl acetate	= Ethylene glycol monoethyl ether acetate
Ethoxylated dodecanol	= Ethoxylated dodecanol
Ethoxylated dodecyl alcohol	= Ethoxylated dodecanol

SYNONYM	COMPOUND NAMES
Ethoxylated lauryl alcohol	= Ethoxylated dodecanol
Ethoxylated myristyl alcohol	= Ethoxylated tetradecanol
Ethoxylated nonylphenol	= Ethoxylated nonylphenol
Ethoxylated pentadecanol	= Ethoxylated pentadecanol
Ethoxylated pentadecylalcohol	= Ethoxylated pentadecanol
Ethoxylated tetradecanol	= Ethoxylated tetradecanol
Ethoxylated tetradecyl alcohol	= Ethoxylated tetradecanol
Ethoxylated tridecanol	= Ethoxylated tridecanol
Ethoxylated tridecyl alcohol	= Ethoxylated tridecanol
Ethoxytriethylene glycol	= Ethoxy triglycol
2-Ethyl-1-hexanol hydrogen phosphate	= Di-(2-ethylhexyl)phosphoric acid
2-Ethyl-1-hexanol	= 2-Ethyl hexanol
2-Ethyl-1-hexylamine	= 2-Ethylhexylamine
2-Ethyl-2-hexenal	= 2-Ethyl-3-propylacrolein
5-Ethyl-2-methyl pyridine	= Methylethylpyridine
6-Ethyl-2-methylaniline	= 2-Methyl-6-ethyl aniline
1-Ethyl-2-methylbenzene	= 2-Ethyl toluene
5-Ethyl-2-picoline	= Methylethylpyridine
Ethyl-3-ethoxypropionate	= Ethyl-3-ethoxypropionate
2-Ethyl-3-propylacrolein	= 2-Ethyl-3-propylacrolein
2-Ethyl-3-propylacrylaldehyde	= 2-Ethyl-3-propylacrolein
2-Ethyl-1-butanol	= Ethyl butanol
N-Ethyl-n-butylamine	= N-Ethyl-n-butylamine
6-Ethyl-o-toluidine	= 2-Methyl-6-ethyl aniline
Ethyl 2-hydroxypropanoate	= Ethyl lactate
Ethyl 2-hydroxypropionate	= Ethyl lactate
Ethyl 2-methacrylate	= Ethyl methacrylate
Ethyl 2-methyl-2-propenoate	= Ethyl methacrylate
Ethyl 2-propenoate	= Ethyl acrylate
Ethyl 3-oxobutanoate	= Ethyl acetoacetate
Ethyl acetate	= Ethyl acetate
Ethyl acetoacetate	= Ethyl acetoacetate
Ethyl acetone	= 2-Pentanone
Ethyl acrylate	= Ethyl acrylate
Ethyl alcohol	= Ethyl alcohol
Ethyl aldehyde	= Acetaldehyde
Ethyl alpha-hydroxypropionate	= Ethyl lactate
Ethyl alpha-methylmethacrylate	= Ethyl methacrylate
Ethyl amyl ketone	= Ethyl amyl ketone
Ethyl beta-ethoxypropionate	= Ethyl-3-ethoxypropionate
Ethyl butanoate	= Ethyl butyrate
Ethyl butanol	= Ethyl butanol
Ethyl butyl ketone	= Ethyl butyl ketone
Ethyl butyrate	= Ethyl butyrate
Ethyl carbonate	= Diethyl carbonate
Ethyl chloroacetate	= Ethyl chloroacetate
Ethyl chloride	= Ethyl chloride
Ethyl chloroacetate	= Ethyl chloroacetate
Ethyl chlorocarbonate	= Ethyl chloroformate
Ethyl chloroethanoate	= Ethyl chloroacetate
Ethyl chloroformate	= Ethyl chloroformate
Ethyl chlorothioformate	= Ethyl chlorothioformate
Ethyl chlorothiolformate	= Ethyl chlorothioformate
Ethyl cyclohexane	= Ethyl cyclohexane

SYNONYM	COMPOUND NAMES
Ethyl dichlorophosphate	= Ethyl phosphorodichloridate
Ethyl dl-lactate	= Ethyl lactate
Ethyl ethanoate	= Ethyl acetate
Ethyl ether	= Ethyl ether
Ethyl formate	= Ethyl formate
Ethyl formic ester	= Ethyl formate
2-Ethyl hexaldehyde	= Ethylhexaldehyde
2-Ethyl hexanol	= 2-Ethyl hexanol
Ethyl hexyl phthalate	= Ethyl hexyl phthalate
Ethyl hexyl tallate	= Ethyl hexyl tallate
Ethyl lactate	= Ethyl lactate
Ethyl mercaptan	= Ethyl mercaptan
Ethyl methacrylate-inhibited	= Ethyl methacrylate
Ethyl methacrylate	= Ethyl methacrylate
Ethyl methanoate	= Ethyl formate
Ethyl methyl ketone	= Methyl ethyl ketone
n-Ethyl morpholine	= n-Ethyl morpholine
Ethyl nitrile	= Acetonitrile
Ethyl nitrite	= Ethyl nitrite
Ethyl orthosilicate	= Ethyl silicate
Ethyl parathion	= Parathion
Ethyl phosphate	= Triethyl phosphate
Ethyl phosphonothioic dichloride	= Ethyl phosphonothioic dichloride
Ethyl phosphorodichloridate	= Ethyl phosphorodichloridate
Ethyl phosphorodichloridothionate	= Ethyl phosphonothioic dichloride
Ethyl phthalate	= Diethyl phthalate
Ethyl propionate	= Ethyl propionate
Ethyl propionyl	= Diethyl ketone
Ethyl silicate 40	= Ethyl silicate
Ethyl silicate condensed	= Ethyl silicate
Ethyl silicate	= Ethyl silicate
Ethyl sulfate	= Diethyl sulfate
Ethyl sulfhydrate	= Ethyl mercaptan
Ethyl thionophosphoryl dichloride	= Ethyl phosphonothioic dichloride
2-Ethyl toluene	= 2-Ethyl toluene
Ethyl vinyl ether	= Vinyl ethyl ether
Ethylacetic acid	= n-Butyric acid
Ethylaluminum dichloride	= Ethylaluminum dichloride
Ethylaluminum sesquichloride	= Ethylaluminum sesquichloride
Ethylamine	= Ethylamine
Ethylbenzene	= Ethylbenzene
2-Ethylbutyl alcohol	= Ethyl butanol
Ethylbutylamine	= N-Ethyl-n-butylamine
2-Ethylcaproaldehyde	= Ethylhexaldehyde
alpha-Ethylcaproic acid	= 2-Ethylhexanoic acid
Ethylcarbinol	= n-Propyl alcohol
Ethylcyanide	= Propionitrile
N-Ethylcyclohexanamine	= N-Ethylcyclohexylamine
N-Ethylcyclohexylamine	= N-Ethylcyclohexylamine
Ethylchlorosilane	= Ethylchlorosilane
Ethylene acetate	= Ethylene glycol diacetate
Ethylene aldehyde	= Acrolein
Ethylene bis (iminodiacetic acid)	= Ethylenediamine tetracetic acid
Ethylene bromide	= Ethylene dibromide

SYNONYM	COMPOUND NAMES
Ethylene carboxylic acid	= Acrylic acid
Ethylene chlorhydrin	= Ethylene chlorohydrin
Ethylene chloride	= Ethylene dichloride
Ethylene chlorohydrin	= Ethylene chlorohydrin
Ethylene cyanohydrin	= Ethylene cyanohydrin
Ethylene diacetate	= Ethylene glycol diacetate
Ethylene dibromide	= Ethylene dibromide
Ethylene dichloride	= Ethylene dichloride
Ethylene dihydrate	= Ethylene glycol
Ethylene glycol acetate	= Ethylene glycol acetate
Ethylene glycol diacetate	= Ethylene glycol diacetate
Ethylene glycol dibutyl ether	= Ethylene glycol dibutyl ether
Ethylene glycol diethyl ether	= Ethylene glycol diethyl ether
Ethylene glycol dihydroxydiethyl ether	= Triethylene glycol
Ethylene glycol dimethyl ether	= Ethylene glycol dimethyl ether
Ethylene glycol ethyl ether	= 2-Ethoxyethanol
Ethylene glycol ethyl ether	= Ethylene glycol monoethyl ether
Ethylene glycol isopropyl ether	= Ethylene glycol isopropyl ether
Ethylene glycol methyl ether acetate	= Ethylene glycol methyl ether acetate
Ethylene glycol monobutyl ether acetate	= Ethylene glycol monobutyl ether acetate
Ethylene glycol monobutyl ether	= Ethylene glycol monobutyl ether
Ethylene glycol monoethyl ether acetate	= 2-Ethoxyethyl acetate
Ethylene glycol monoethyl ether acetate	= Ethylene glycol monoethyl ether acetate
Ethylene glycol monoethyl ether	= 2-Ethoxyethanol
Ethylene glycol monoethyl ether	= Ethylene glycol monoethyl ether
Ethylene glycol monomethyl ether acetate	= Ethylene glycol methyl ether acetate
Ethylene glycol monomethyl ether	= Ethylene glycol monomethyl ether
Ethylene glycol monopropyl ether	= Ethylene glycol propyl ether
Ethylene glycol phenyl ether	= Ethylene glycol phenyl ether
Ethylene glycol propyl ether	= Ethylene glycol propyl ether
Ethylene glycol, monoacetate	= Ethylene glycol acetate
Ethylene glycol	= Ethylene glycol
Ethylene oxide	= Ethylene oxide
Ethylene	= Ethylene
Ethylenebis [dithiocarbamic acid], disodium salt	= Nabam
Ethylenediamine tetracetic acid	= Ethylenediamine tetracetic acid
Ethylenediamine	= Ethylenediamine
Ethylenediamine	= Ethylenediamine
trans-1,2-Ethylenedicarboxylic acid	= Fumaric acid
cis-1,2-Ethylenedicarboxylic acid	= Maleic acid
(Ethylenedinitrilo) tetraacetic acid	= Ethylenediamine tetracetic acid
2,2'-Ethylenedioxydiethanol	= Triethylene glycol
Ethyleneimine	= Ethyleneimine
Ethylhexaldehyde	= Ethylhexaldehyde
2-Ethylhexanal	= Ethylhexaldehyde
2-Ethylhexanoic acid	= 2-Ethylhexanoic acid
2-Ethylhexoic acid	= 2-Ethylhexanoic acid
2-Ethylhexyl acetate	= 2-Ethylhexyl acetate
2-Ethylhexyl acrylate	= 2-Ethylhexyl acrylate
2-Ethylhexyl alcohol	= 2-Ethyl hexanol
Bis-(2-Ethylhexyl) hydrogen phosphate	= Di-(2-ethylhexyl)phosphoric acid
Bis(2-Ethylhexyl) phthalate	= Di-(2-ethylhexyl)phthalate

SYNONYM	COMPOUND NAMES
bis-(2-Ethylhexyl) phthalate	= Dioctyl phthalate
Bis-(2-Ethylhexyl) sodium sulfosuccinate	= Dioctyl sodium sulfosuccinate
Bis-(2-Ethylhexyl)phthalate	= Ethyl hexyl phthalate
2-Ethylhexyl, 2-propenoate	= 2-Ethylhexyl acrylate
2-Ethylhexylamine	= 2-Ethylhexylamine
beta-Ethylhexylamine	= 2-Ethylhexylamine
Ethylidene chloride	= 1,1-Dichloroethane
Ethylidene dichloride	= 1,1-Dichloroethane
Ethylidene diethylether	= Acetal
Ethylidene difluoride	= 1,1-Difluoroethane
Ethylidene fluoride	= 1,1-Difluoroethane
Ethylidene norbornene	= Ethylidene norbornene
5-Ethylidenebicyclo (2, 2, 1)hept-2-ene	= Ethylidene norbornene
Ethylidenenorbornylene	= Ethylidene norbornene
Ethylidenenorcamphene	= Ethylidene norbornene
o-Ethylmethylbenzene	= 2-Ethyl toluene
Ethylmethylketone peroxide	= 2-Butanone peroxide
n-Ethylmorpholine	= n-Ethyl morpholine
4-Ethylmorpholine	= n-Ethyl morpholine
2-Ethylphenol	= Ethylphenol
Ethylphenol	= Ethylphenol
o-Ethylphenol	= Ethylphenol
Ethylphenyldichlorosilane	= Ethylphenyldichlorosilane
Ethylpyrophosphate	= Tetraethyl pyrophosphate
Ethylsilicon trichloride	= Ethyltrichlorosilane
o-Ethyltoluene	= 2-Ethyl toluene
Ethyltrichlorosilane	= Ethyltrichlorosilane
Ethylzinc	= Diethylzinc
Ethyne	= Acetylene
Ethynyl carbinol	= Propargyl alcohol
Ethynyl methanol	= Propargyl alcohol
Eufin	= Diethyl carbonate
Eunatrol	= Oleic acid, sodium salt
Exitelite	= Antimony trioxide
F-11	= Trichlorofluoromethane
F-114	= Dichlorotetrafluoroethane
F-12	= Dichlorodifluoromethane
F-124	= Monochlorotetrafluoroethane
F-13	= Monochlorotrifluoromethane
F-21	= Dichloromonofluoromethane
Falkitol	= Hexachloroethane
Fasciolin	= Hexachloroethane
Fast red GG base	= 4-Nitroaniline
Fast red IG base	= 4-Nitroaniline
Fast red TR base	= 4-Chloro-o-toluidine
Fast white	= Lead sulfate
Fenoprop	= 2-(2,4,5-Trichlorophenoxy) propanoic acid
Fermentation alcohol	= Ethyl alcohol
Fermentation amyl alcohol	= Isoamyl alcohol
Fermentation butyl alcohol	= Isobutyl alcohol
Fermine	= Dimethyl phthalate
Ferric ammonium citrate, brown	= Ferric ammonium citrate
Ferric ammonium citrate, green	= Ferric ammonium citrate

SYNONYM	COMPOUND NAMES
Ferric ammonium citrate	= Ferric ammonium citrate
Ferric ammonium oxalate	= Ferric ammonium oxalate
Ferric chloride, anhydrous	= Ferric chloride
Ferric chloride, hexahydrate	= Ferric chloride
Ferric chloride	= Ferric chloride
Ferric fluoride	= Ferric fluoride
Ferric glycerophosphate	= Ferric glycerophosphate
Ferric nitrate nonahydrate	= Ferric nitrate
Ferric nitrate	= Ferric nitrate
Ferric sulfate	= Ferric sulfate
Ferrophosphorus	= Ferrophosphorus
Ferrosilicon	= Ferrosilicon
Ferrous ammonium sulfate hexahydrate	= Ferrous ammonium sulfate
Ferrous ammonium sulfate	= Ferrous ammonium sulfate
Ferrous borofluoride	= Ferrous fluoroborate
Ferrous chloride tetrahydrate	= Ferrous chloride
Ferrous chloride	= Ferrous chloride
Ferrous fluoroborate	= Ferrous fluoroborate
Ferrous oxalate dihydrate	= Ferrous oxalate
Ferrous oxalate	= Ferrous oxalate
Ferrous sulfate	= Ferrous sulfate
Ferrox	= Ferrous oxalate
Fertilizer acid	= Sulfuric acid
Filmerine	= Sodium nitrite
Flaxseed oil	= Oils, miscellaneous: linseed
Flexol plasticizer DIOP	= Diisooctyl phthalate
Flouristan	= Stannous flouride
Flowers of antimony	= Antimony trioxide
Fluophosgene	= Carbon oxyfluoride
Fluorane 114	= Dichlorotetrafluoroethane
Fluorine	= Fluorine
2-Fluoro-1-methylbenzene	= 2-Fluorotoluene
4-Fluoro-1-methylbenzene	= 4-Fluorotoluene
1-Fluoro-2-methylbenzene	= 2-Fluorotoluene
1-Fluoro-3-methylbenzene	= 3-Fluorotoluene
1-Fluoro-4-methylbenzene	= 4-Fluorotoluene
Fluoroacetic acid, sodium salt	= Sodium fluoroacetate
o-Fluoroaniline	= 2-Fluoroaniline
2-Fluoroaniline	= 2-Fluoroaniline
4-Fluoroaniline	= 4-Fluoroaniline
p-Fluoroaniline	= 4-Fluoroaniline
2-Fluorobenzenamine	= 2-Fluoroaniline
4-Fluorobenzenamine	= 4-Fluoroaniline
Fluorobenzene	= Fluorobenzene
Fluorodichloromethane	= Dichloromonofluoromethane
Fluoroethylene	= Vinyl fluoride
Fluoroformyl fluoride	= Carbon oxyfluoride
2-Fluorophenylamine	= 2-Fluoroaniline
4-Fluorophenylamine	= 4-Fluoroaniline
Fluorophosgene	= Carbon oxyfluoride
Fluorosilic acid	= Fluosilicic acid
Fluorosilic acid	= Hydrofluorosilicic acid (25% or less)
Fluorosulfonic acid	= Fluosulfonic acid
Fluorosulfuric acid	= Fluosulfonic acid

SYNONYM	COMPOUND NAMES
2-Fluorotoluene	= 2-Fluorotoluene
o-Fluorotoluene	= 2-Fluorotoluene
m-Fluorotoluene	= 3-Fluorotoluene
3-Fluorotoluene	= 3-Fluorotoluene
4-Fluorotoluene	= 4-Fluorotoluene
p-Fluorotoluene	= 4-Fluorotoluene
Fluorspar	= Calcium fluoride
Fluosilicic acid	= Fluosilicic acid
Fluospar	= Calcium fluoride
Fluosulfonic acid	= Fluosulfonic acid
Fluxing oil	= Asphalt blending stocks: roofers flux
Foliage oil	= Oils, miscellaneous: spray
Formaldehyde dimethylacetol	= Methyl formal
Formaldehyde polymer	= Paraformaldehyde
Formaldehyde solution	= Formaldehyde solution
Formalin	= Formaldehyde solution
Formalith	= Formaldehyde solution
Formamide	= Formamide
Formic acid, amide	= Formamide
Formic acid, ammonium salt	= Ammonium formate
Formic acid, ethyl ester	= Ethyl formate
Formic acid, methyl ester	= Methyl formate
Formic acid, zinc salt	= Zinc formate
Formic acid	= Formic acid
Formic aldehyde solution	= Formaldehyde solution
Formic ether	= Ethyl formate
Formyl tribromide	= Bromoform
Formylformic acid	= Glyoxylic acid (50% or less)
Formylic acid	= Formic acid
2-Formylphenol	= Salicylaldehyde
Fowlers solution	= Potassium arsenite
Freemans white lead	= Lead sulfate
French verdigris	= Copper subacetate
Freon-22	= Chlorodifluoromethane
Freon 11	= Trichlorofluoromethane
Freon 113	= 1,1,2-Trichloro-1,2,2-trifluoroethane
Freon 114	= Dichlorotetrafluoroethane
Freon 12	= Dichlorodifluoromethane
Freon 13	= Monochlorotrifluoromethane
Freon 21	= Dichloromonofluoromethane
Frigen 11	= Trichlorofluoromethane
Frigen 113TR	= 1,1,2-Trichloro-1,2,2-trifluoroethane
Frigen 12	= Dichlorodifluoromethane
Fuel oil 1-D	= Oils: diesel
Fuel oil 2-D	= Oils: diesel
Fuel oil no. 1	= Jet fuels: JP-1
Fuel oil no. 1	= Kerosene
Fuel oil no. 1	= Oils, miscellaneous: range
Fumaric acid	= Fumaric acid
Fumigrain	= Acrylonitrile
Fuming liquid arsenic	= Arsenic trichloride
Fuming sulfuric acid	= Oleum
Furadan	= Carbofuran
Fural/pyromucic aldehyde	= Furfural

SYNONYM	COMPOUND NAMES
Fural	= Furfural
2-Furaldehyde	= Furfural
Furan	= Furan
2-Furancarbinol	= Furfuryl alcohol
2,5-Furanedione	= Maleic anhydride
Furfural	= Furfural
Furfuralcohol	= Furfuryl alcohol
Furfuraldehyde	= Furfural
Furfuran	= Furan
Furfurole	= Furfural
Furfuryl alcohol	= Furfuryl alcohol
2-Furylcarbinol	= Furfuryl alcohol
Fusel oil	= Isoamyl alcohol
Fyde	= Formaldehyde solution
Galena	= Lead sulfide
Gallic acid monohydrate	= Gallic acid
Gallic acid	= Gallic acid
Gallotannic acid	= Tannic acid
Gallotannin	= Tannic acid
Gammexane	= gamma-Benzene hexachloride
Gas oil: cracked	= Gas oil: cracked
Gasoline blending stocks: alkylates	= Gasoline blending stocks: alkylates
Gasoline blending stocks: reformates	= Gasoline blending stocks: reformates
Gasolines: automotive (<4.23g lead/gal)	= Gasolines: automotive (<4.23g lead/gal)
Gasolines: aviation (< 4.86g lead/gal)	= Gasolines: aviation (< 4.86g lead/gal)
Gasolines: casinghead	= Gasolines: casinghead
Gasolines: polymer	= Gasolines: polymer
Gasolines: straight run	= Gasolines: straight run
GC-1189	= Kepone
Gelbin yellow ultramarine	= Calcium chromate
Gemalgene	= Trichloroethylene
Genetron-22	= Chlorodifluoromethane
Genetron 11	= Trichlorofluoromethane
Genetron 1113	= Trifluorochloroethylene
Genetron 12	= Dichlorodifluoromethane
Gerhardite	= Copper nitrate
Glacial acetic acid	= Acetic acid
D-Glucitol	= Sorbitol
Glucose solution	= Dextrose solution
Glutaraldehyde solution	= Glutaraldehyde solution
Glycerine	= Glycerine
Glycerite	= Tannic acid
Glycerol trichlorhydrin	= 1,2,3-Trichloropropane
Glycerol	= Glycerine
Glyceryl trichlorhydrin	= 1,2,3-Trichloropropane
Glycidyl alpha-methyl acrylate	= Glycidyl methacrylate
Glycidyl isopropyl ether	= Isopropyl glycidyl ether
Glycidyl methacrylate	= Glycidyl methacrylate
Glycine copper complex	= Copper glycinate
Glycocol-copper	= Copper glycinate
Glycol-monoacetin	= Ethylene glycol acetate
Glycol butyl ether	= Ethylene glycol monobutyl ether
Glycol chlorohydrin	= Ethylene chlorohydrin
Glycol cyanohydrin	= Ethylene cyanohydrin



SYNONYM	COMPOUND NAMES
Glycol diacetate	= Ethylene glycol diacetate
Glycol dibromide	= Ethylene dibromide
Glycol dichloride	= Ethylene dichloride
Glycol monoacetate	= Ethylene glycol acetate
Glycol monobutyl ether acetate	= Ethylene glycol monobutyl ether acetate
Glycol monoethyl ether acetate	= 2-Ethoxyethyl acetate
Glycol monoethyl ether acetate	= Ethylene glycol monoethyl ether acetate
Glycol monoethyl ether	= 2-Ethoxyethanol
Glycol monoethyl ether	= Ethylene glycol monoethyl ether
Glycol monomethyl ether acetate	= Ethylene glycol methyl ether acetate
Glycol monomethylether	= Ethylene glycol monomethyl ether
Glycol	= Ethylene glycol
Glyoxal	= Glyoxal
Glyoxylic acid (50% or less)	= Glyoxylic acid (50% or less)
Grain alcohol	= Ethyl alcohol
Grape sugar solution	= Dextrose solution
Gray arsenic	= Arsenic
Green nickel oxide	= Nickel hydroxide
Green oil	= Anthracene
Green verdigris	= Copper subacetate
Green vitriol	= Ferrous sulfate
Gum turpentine	= Turpentine
Gusathion insecticide	= Azinphos methyl
Guthion insecticide	= Azinphos methyl
Halocarbon 21	= Dichloromonofluoromethane
Halogenated waxes	= Polychlorinated biphenyl
Halon 112	= Dichloromonofluoromethane
Halon 122	= Dichlorodifluoromethane
Halon 241	= Monochlorotetrafluoroethane
Halon 242	= Dichlorotetrafluoroethane
Hartshorn	= Ammonium carbonate
Hatcol XPE	= 1-Phenyl-1-xylyl ethane
HCBD	= Hexachlorobutadiene
HEA	= 2-Hydroxyethyl acrylate
Hendecanoic acid	= Undecanoic acid
Hendecanoic alcohol	= Undecanol
1-Hendecanol	= Undecanol
Heod	= Dieltrin
Heptachlor	= Heptachlor
1,4,5,6,7,8,8a- Heptachlorodicyclopentadiene	= Heptachlor
1-Heptadecanecarboxylic acid	= Stearic acid
cis-8-Heptadecylenecarboxylic acid	= Oleic acid
Heptane	= Heptane
n-Heptane	= Heptane
1-Heptanecarboxylic acid	= Octanoic acid
Heptanoic acid	= Heptanoic acid
1-Heptanol	= Heptanol
Heptanol	= Heptanol
3-Heptanone	= Ethyl butyl ketone
2-Heptanone	= Methylamyl ketone
2-Heptanone	= n-Amyl methyl ketone
Heptanyl acetate	= Heptyl acetate
1-Heptene	= 1-Heptene

SYNONYM	COMPOUND NAMES
Hepthlic acid	= Heptanoic acid
n-Heptoic acid	= Heptanoic acid
Heptyl acetate	= Heptyl acetate
n-Heptyl acetate	= Heptyl acetate
1-Heptyl acetate	= Heptyl acetate
Heptyl alcohol	= Heptanol
Heptylcarbinol	= Octanol
Heptylene	= 1-Heptene
n-Heptylethylene	= 1-Nonene
n-Heptylic acid	= Heptanoic acid
Hexa	= Hexamethylenetetramine
Hexachloro-1,3-butadiene	= Hexachlorobutadiene
1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4-endo-exo-5,8-dimethanonaphthalene.	= Aldrin
endo,exo-1,2,3,4,10,10-Hexachloro-6,7-expoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4:5,8-dimethanonaphthalene	= Dieldrin
Hexachlorobenzene	= Hexachlorobenzene
Hexachlorobutadiene	= Hexachlorobutadiene
1,2,3,4,5,6-Hexachlorocyclohexane	= gamma-Benzene hexachloride
Hexachlorocyclopentadiene dimer	= Mirex
Hexachlorocyclopentadiene	= Hexachlorocyclopentadiene
Hexachloroethane	= Hexachloroethane
Hexachlorophene	= Hexachlorophene
Hexacid 1095	= Decanoic acid
Hexacid 698	= Hexanoic acid
Hexacid 898	= Octanoic acid
Hexadecyl sulfate, sodium salt	= Hexadecyl sulfate, sodium salt
Hexadecyltrimethylammonium chloride	= Hexadecyltrimethylammonium chloride
Hexadrin	= Endrin
Hexafluosilicic acid	= Fluosilicic acid
Hexahydric alcohol	= Sorbitol
Hexahydro-1,4-diazine	= Piperazine
Hexahydro-2h-azepine-2-one	= Caprolactam
Hexahydroaniline	= Cyclohexylamine
Hexahydroazepine	= Hexamethylenimine
Hexahydrobenzene	= Cyclohexane
Hexahydrocresols	= 2-Methylcyclohexanol
Hexahydrocumene	= Isopropyl cyclohexane
Hexahydrophenol	= Cyclohexanol
Hexahydropyrazine	= Piperazine
Hexahydrotoluene	= Methylcyclohexane
n-Hexaldehyde	= n-Hexaldehyde
Hexalin	= Cyclohexanol
Hexamethylene	= Cyclohexane
Hexamethylenediamine	= Hexamethylenediamine
Hexamethylenetetramine	= Hexamethylenetetramine
Hexamethylenimine	= Hexamethylenimine
Hexamine	= Hexamethylenetetramine
Hexanal	= n-Hexaldehyde
Hexanaphthene	= Cyclohexane
Hexane carboxylic acid	= Heptanoic acid

SYNONYM	COMPOUND NAMES
Hexane, 1,6-diisocyanato- 2,2,4(2,4,4)-trimethyl-	= Trimethylhexamethylene diisocyanate
Hexane	= n-Hexane
n-Hexane	= n-Hexane
1,6-Hexanediamine, 2,2,4(or2,4,4)-trimethyl-	= Trimethyl hexamethylene diamine
1,6-Hexanediamine	= Hexamethylenediamine
Hexanedinitrile	= Adiponitrile
Hexanedioic acid, dimethyl ester	= Dimethyl adipate
Hexanedioic acid	= Adipic acid
1,2,3,4,5,6-Hexannehexol	= Sorbitol
Hexanoic acid, 2-ethyl-	= 2-Ethylhexanoic acid
Hexanoic acid	= Hexanoic acid
n-Hexanol	= 1-Hexanol
1-Hexanol	= 1-Hexanol
2-Hexanone	= Methyl n-butyl ketone
Hexaplas M/1B	= Diisobutyl phthalate
Hexaplas M/O	= Diisooctyl phthalate
alpha-Hexene	= 1-Hexene
1-Hexene	= 1-Hexene
iso-Hexene	= 2-Methyl-1-pentene
n-Hexoic acid	= Hexanoic acid
Hexone	= Methyl isobutyl ketone
n-Hexyl acetate	= Hexyl acetate
Hexyl acetate	= Hexyl acetate
1-Hexyl acetate	= Hexyl acetate
Hexyl acetate	= Methyl amyl acetate
Hexyl alcohol, acetate	= Hexyl acetate
n-Hexyl alcohol	= 1-Hexanol
sec-Hexyl alcohol	= Ethyl butanol
Hexyl carbitol	= Diethylene glycol n-hexyl ether
Hexyl ethanoate	= Hexyl acetate
Hexylene glycol	= Hexylene glycol
Hexylene	= 1-Hexene
HFSA	= Hydrofluorosilicic acid (25% or less)
HHDN	= Aldrin
Hi-dry	= Tetraethylene glycol
High speed bearing oil	= Oils, miscellaneous: spindle
Higher fatty alcohol	= Tallow fatty alcohol
HMDA	= Hexamethylenediamine
Home-heating oil	= Oils, fuel: 2
Homopiperidine	= Hexamethylenimine
Household ammonia	= Ammonium hydroxide (<28% aqueous ammonia)
HSDB 5700	= 2-Hydroxy-4-(methylthio)-butanoic acid
HTH dry chlorine	= Calcium hypochlorite
HTH	= Calcium hypochlorite
Hydracrylic acid, beta-lactone	= beta-Propiolactone
Hydracrylonitrile	= Ethylene cyanohydrin
Hydrazine-benzene	= Phenylhydrazine
Hydrazine	= Hydrazine
Hydrazinobenzene	= Phenylhydrazine
Hydrazoic acid, sodium salt	= Sodium azide
Hydrobromic acid monoammoniate	= Ammonium bromide

SYNONYM	COMPOUND NAMES
Hydrobromic acid, anhydrous	= Hydrogen bromide
Hydrochloric acid, anhydrous	= Hydrogen chloride
Hydrochloric acid	= Hydrochloric acid
Hydrocyanic acid, sodium salt	= Sodium cyanide
Hydrocyanic acid	= Hydrogen cyanide
Hydrocyanic ether	= Propionitrile
Hydrofluoric acid, anhydrous	= Hydrogen fluoride
Hydrofluoric acid	= Hydrofluoric acid
Hydrofluorosilicic acid (25% or less)	= Hydrofluorosilicic acid (25% or less)
Hydrofluosilic acid	= Fluosilicic acid
Hydrofol acid 1255 or 1295	= Lauric acid
Hydrogen bromide, anhydrous	= Hydrogen bromide
Hydrogen bromide	= Hydrogen bromide
Hydrogen chloride	= Hydrogen chloride
Hydrogen cyanide	= Hydrogen cyanide
Hydrogen fluoride	= Hydrogen fluoride
Hydrogen hexafluorosilicate	= Fluosilicic acid
Hydrogen peroxide carbamide	= Urea peroxide
Hydrogen peroxide	= Hydrogen peroxide
Hydrogen sulfide	= Hydrogen sulfide
Hydrogen	= Hydrogen
para-Hydrogen	= Hydrogen
1-Hydroperoxycyclohexyl	= Cyclohexanone peroxide
Hydroquinol	= Hydroquinone
Hydroquinone	= Hydroquinone
N-Hydroxyethyl-1,2-ethanediamine	= Aminoethylethanolamine
2-Hydroxy-1,2,3-propane-tricarboxylic acid	= Citric acid
1-Hydroxy-2-cyanoethane	= Ethylene cyanohydrin
2-Hydroxy-2-methyl-3-butyne	= Methyl butynol
2-Hydroxy-2-methylpropanenitrile	= Acetone cyanohydrin
1-Hydroxy-2-phenoxyethane	= Ethylene glycol phenyl ether
1-Hydroxy-2,4-dinitro-benzene	= 2,4-Dinitrophenol
6-Hydroxy-3-(2h)-pyridazinone	= Maleic hydrazide
2-Hydroxy-4-(methylthio)-butanoic acid	= 2-Hydroxy-4-(methylthio)-butanoic acid
4-Hydroxy-4-methyl-2-pentanone	= Diacetone alcohol
2-Hydroxy-m-xylene	= Xylenol
beta-Hydroxy-tricarboxylic acid	= Citric acid
Alpha-Hydroxy isobutronitrile	= Acetone cyanohydrin
O-Hydroxybenzaldehyde	= Salicylaldehyde
Hydroxybenzene	= Phenol
o-Hydroxybenzoic acid	= Salicylic acid
1-Hydroxybutane	= n-Butyl alcohol
2-Hydroxybutane	= sec-Butyl alcohol
2-Hydroxychlorobenzene	= o-Chlorophenol
Hydroxycyclohexane	= Cyclohexanol
1-Hydroxycyclohexyl peroxide	= Cyclohexanone peroxide
Hydroxydimethylarsine oxide	= Cacodylic acid
Bis-[2-(2-Hydroxyethoxy) ethyl ether	= Tetraethylene glycol
2-Hydroxyethyl 2-propenoate	= 2-Hydroxyethyl acrylate
2-Hydroxyethyl acetate	= Ethylene glycol acetate
2-Hydroxyethyl acrylate	= 2-Hydroxyethyl acrylate
beta-Hydroxyethyl acrylate	= 2-Hydroxyethyl acrylate
b-Hydroxyethyl isopropyl ether	= Ethylene glycol isopropyl ether

SYNONYM	COMPOUND NAMES
Bis-(2-Hydroxyethyl) amine	= Diethanolamine
Bis-(2-Hydroxyethyl) ether	= Diethylene glycol
Tris(Hydroxyethyl)amine	= Triethanolamine
2-Hydroxyethylamine	= Monoethanolamine
N-Beta-Hydroxyethylethylenediamine	= Aminoethylethanolamine
1-Hydroxyheptane	= Heptanol
1-Hydroxyhexane	= 1-Hexanol
Hydroxylamine sulfate	= Hydroxylamine sulfate
Hydroxylamine	= Hydroxylamine
2,2-bis(Hydroxymethyl)-1,3-propanediol	= Pentaerythritol
2-Hydroxymethylfuran	= Furfuryl alcohol
2-Hydroxynitrobenzene	= 2-Nitrophenol
3-Hydroxynitrobenzene	= 3-Nitrophenol
m-Hydroxynitrobenzene	= 3-Nitrophenol
4-Hydroxynitrobenzene	= 4-Nitrophenol
2,2-Bis(4-Hydroxyphenyl)propane	= Bisphenol A
3-Hydroxypropanenitrile	= Ethylene cyanohydrin
2-Hydroxypropanoic acid	= Lactic acid
alpha-Hydroxypropionic acid	= Lactic acid
2-Hydroxypropionitrile	= Lactonitrile solution (80% or less)
Hydroxypropyl acrylate	= Hydroxypropyl acrylate
Hydroxypropyl methacrylate	= Hydroxypropyl methacrylate
Tris(2-Hydroxypropyl) amine	= Triisopropanolamine
2-Hydroxypropylamine	= Monoisopropanolamine
Alpha-Hydroxytoluene	= Benzyl alcohol
3-Hydroxytoluene	= m-Cresol
o-Hydroxytoluene	= o-Cresol
4-Hydroxytoluene	= p-Cresol
Hydroxytoluenes	= Cresols
beta-Hydroxytricarballic acid	= Citric acid
2-Hydroxytriethylamine	= N,N-Diethylethanolamine
Hylene M50	= Diphenylmethane diisocyanate
Hylene T	= Toluene 2,4-diisocyanate
Hystrene 9512	= Lauric acid
Hytrol O	= Cyclohexanone
IBN	= Isobutyronitrile
Illuminating oil	= Kerosene
1,1'-Iminodi-2-propanol	= Diisopropanolamine
2,2'-Iminodiethanol	= Diethanolamine
Imperial green	= Copper acetoarsenite
Inedible tallow	= Tallow
Insulating oil	= Oils, miscellaneous: transformer
Iodomethane	= Methyl iodide
IPDI	= Isophorone diisocyanate
Iron (ous) sulfate	= Ferrous sulfate
Iron ammonium sulfate	= Ferrous ammonium sulfate
Iron dichloride	= Ferrous chloride
Iron fluoride	= Ferric fluoride
Iron III chloride	= Ferric chloride
Iron perchloride	= Ferric chloride
Iron protochloride	= Ferrous chloride
Iron protoxalate	= Ferrous oxalate
Iron sesquisulfate	= Ferric sulfate
Iron tersulfate	= Ferric sulfate

SYNONYM	COMPOUND NAMES
Iron trichloride	= Ferric chloride
Iron vitriol	= Ferrous sulfate
Iron(III) sulfate	= Ferric sulfate
Isceon 11	= Trichlorofluoromethane
Isoamyl alcohol	= Isoamyl alcohol
Isoamyl ethanoate	= Isoamylacetate
Isoamylacetate	= Isoamylacetate
Isobutane	= Isobutane
Isobutanol-2-amine	= 2-Amino-2-methyl-1-propanol (90% or less)
Isobutanol amine	= 2-Amino-2-methyl-1-propanol (90% or less)
Isobutanol	= Isobutyl alcohol
Isobutene trimer	= Triisobutylene
Isobutene	= Isobutylene
Isobutyl 2-methyl-2-propenoate	= Isobutyl methacrylate
Isobutyl 2-propenoate	= iso-butyl acrylate
Isobutyl acetate	= Isobutyl acetate
Isobutyl alcohol	= Isobutyl alcohol
Isobutyl alpha-methacrylate	= Isobutyl methacrylate
Isobutyl isobutyrate	= Isobutyl isobutyrate
Isobutyl methacrylate	= Isobutyl methacrylate
Isobutyl methyl ketone	= Methyl isobutyl ketone
Isobutyl methylmethanol	= Methyl amyl alcohol
Isobutyl phthalate	= Diisobutyl phthalate
Isobutylaldehyde	= iso-butyraldehyde
Isobutylamine	= Isobutylamine
Isobutylcarbinol	= Isoamyl alcohol
Isobutylene	= Isobutylene
Isobutylmethylcarbinol	= Methyl amyl alcohol
Isobutylmethylcarbinol	= Methyl isobutyl carbinol
Isobutyraldehyde	= iso-butyraldehyde
1-Isobutyrate	= 1-Isobutyrate
Isobutyric acid	= Isobutyric acid
Isobutyric aldehyde	= iso-butyraldehyde
Isobutyronitrile	= Isobutyronitrile
Isocetyl trichlorophenoxyacetate	= 2,4,5-T esters
Isocumene	= n-Propylbenzene
Isocyanatomethane	= Methyl isocyanate
Isocyanic acid, methyl ester	= Methyl isocyanate
Isodecaldehyde, mixed isomers	= Isodecaldehyde
Isodecaldehyde	= Isodecaldehyde
Isodecyl acrylate	= Isodecyl acrylate
Isodecyl alcohol	= Isodecyl alcohol
Isodiprene	= Carene
Isodurene	= 1,2,3,5-Tetramethylbenzene
Isohexane	= Isohexane
Isonitropropane	= 2-Nitropropane
Isooctaldehyde	= Isooctaldehyde
Isooctyl alcohol	= Isooctyl alcohol
Isooctyl ester	= Isooctyl ester
Isooctylaldehyde	= Isooctaldehyde
Isopentane	= Isopentane
Isopentyl acetate	= Isoamylacetate

SYNONYM	COMPOUND NAMES
Isopentyl alcohol	= Isoamyl alcohol
Isopentyl nitrite	= iso-Amyl nitrite
Isophorone diamine diisocyanate	= Isophorone diisocyanate
Isophorone diamine	= Isophorone diamine
Isophorone diisocyanate	= Isophorone diisocyanate
Isophorone	= Isophorone
Isophthalic acid	= Isophthalic acid
Isoprene	= Isoprene
Isopropanol	= Isopropyl alcohol
Isopropanolamine	= Monoisopropanolamine
Isopropene cyanide	= Methacrylonitrile
Isopropenyl methyl ketone	= Methyl isopropenyl ketone
Isopropenylbenzene	= alpha-Methylstyrene
Isopropenyl nitrile	= Methacrylonitrile
2-Isopropoxy propane	= Isopropyl ether
2-Isopropoxyethanol	= Ethylene glycol isopropyl ether
Isopropyl 2, 4-dichlorophenoxy acetate	= 2,4-D esters
Isopropyl acetate	= Isopropyl acetate
Isopropyl alcohol	= Isopropyl alcohol
Isopropyl cellosolve	= Ethylene glycol isopropyl ether
Isopropyl cyanide	= Isobutyronitrile
Isopropyl cyclohexane	= Isopropyl cyclohexane
Isopropyl epoxypropyl ether	= Isopropyl glycidyl ether
Isopropyl ether	= Isopropyl ether
Isopropyl glycidyl ether	= Isopropyl glycidyl ether
Isopropyl glycol	= Ethylene glycol isopropyl ether
Isopropyl mercaptan	= Isopropyl mercaptan
Isopropyl methyl ketone	= 3-Methyl-2-butanone
Isopropyl percarbonate	= Isopropyl percarbonate
Isopropyl peroxydicarbonate	= Isopropyl percarbonate
o-Isopropyl phenol	= o-Isopropyl phenol
2-Isopropyl phenol	= o-Isopropyl phenol
Isopropylacetone	= Methyl isobutyl ketone
Isopropylamine	= Dodecylbenzenesulfonic acid, isopropylamine salt
dodecylbenzenesulfonate	
Isopropylamine	= Isopropylamine
Isopropylamino-s-triazine	= Atrazine
Isopropylbenzene hydroperoxide	= Cumene hydroperoxide
Isopropylbenzene	= Cumene
Isopropylcarbinol	= Isobutyl alcohol
Isopropylcumyl hydroperoxide	= Diisopropylbenzene hydroperoxide
Isopropylformic acid	= Isobutyric acid
4,4'-Isopropylidenediphenol	= Bisphenol A
Isopropylideneacetone	= Mesityl oxide
4,4'-Isopropylidenediphenol-	= Bisphenol A diglycidyl ether
p-Isopropyltoluene	= p-Cymene
Isopropyltoluol	= p-Cymene
Isothiocyanatomethane	= Methyl isothiocyanate
Isothiocyanic acid, methyl ester	= Methyl isothiocyanate
Isothiourea	= Thiocarbamide
Isotridecanol	= Tridecanol
Isotridecyl alcohol	= Tridecanol
Isotron-22	= Chlorodifluoromethane
Isotron 11	= Trichlorofluoromethane

SYNONYM	COMPOUND NAMES
Isotron 12	= Dichlorodifluoromethane
Isovaleral	= Isovaleraldehyde
Isovaleraldehyde	= Isovaleraldehyde
Isovaleric aldehyde	= Isovaleraldehyde
Isovalerone	= Diisobutyl ketone
Javelle water	= Sodium hypochlorite solution
Jayflex DTDp	= Ditridecyl phthalate
Jet fuel: JP-1	= Kerosene
Jet fuels: JP-1	= Jet fuels: JP-1
Jet fuels: JP-3	= Jet fuels: JP-3
Jet fuels: JP-4	= Jet fuels: JP-4
Jet fuels: JP-5	= Jet fuels: JP-5
JP-1	= Oils, fuel: no. 1
JP-1	= Oils, miscellaneous: range
K-flex DP	= Dipropylene glycol dibenzoate
Karmex	= Diuron
Kel F monomer	= Trifluorochloroethylene
Kelthane	= 4,4'-Dichloro-alpha-trichloromethyl benzhydrol
Kelthanethanol	= 4,4'-Dichloro-alpha-trichloromethyl benzhydrol
Kepone	= Kepone
Kerosene, heavy	= Jet fuels: JP-5
Kerosene, heavy	= Oils, miscellaneous: spray
Kerosene	= Jet fuels: JP-1
Kerosene	= Kerosene
Kerosene	= Oils, fuel: no. 1
Kerosene	= Oils, miscellaneous: range
Kerosine	= Jet fuels: JP-1
Kerosine	= Kerosene
Kerosine	= Oils, fuel: no. 1
Kerosine	= Oils, miscellaneous: range
2-Ketoheptane	= n-Amyl methyl ketone
2-Ketohexamethylenimine	= Caprolactam
Ketone, heptyl methyl	= Methyl heptyl ketone
Ketonox	= 2-Butanone peroxide
Kettle rendered lard	= Oils, edible: lard
Killax	= Tetraethyl pyrophosphate
Killmaster	= Dursban
King's gold	= Arsenic trisulfide
King's green	= Copper acetoarsenite
King's yellow	= Arsenic trisulfide
Korax	= 1-Chloro-1-nitropropane
Kurosalg	= 2-(2,4,5-Trichlorophenoxy) propanoic acid
Kwik-kil	= Strychnine
DL-Lactic acid, ammonium salt	= Ammonium lactate
Lactic acid, ethyl ester	= Ethyl lactate
Lactic acid	= Lactic acid
Lactonitrile solution (80% or less)	= Lactonitrile solution (80% or less)
LAH	= Lithium aluminum hydride
Lanarkite	= Lead sulfate
Lard	= Oils, edible: lard
Latex, liquid synthetic	= Latex, liquid synthetic



SYNONYM	COMPOUND NAMES
Laughing gas	= Nitrous oxide
Lauric acid	= Lauric acid
Laurostearic acid	= Lauric acid
Lauroyl peroxide	= Lauroyl peroxide
Lauryl alcohol	= Dodecanol
Lauryl ammonium sulfate	= Ammonium lauryl sulfate
Lauryl magnesium sulfate	= Dodecyl sulfate, magnesium salt
Lauryl mercaptan	= Lauryl mercaptan
Lauryl methacrylate	= Dodecylmethacrylate
Lauryl sodium sulfate	= Dodecyl sulfate, sodium salt
Lauryl sulfate, diethanolamine salt solution	= Dodecyl sulfate, diethanolamine salt
Lauryl sulfate, magnesium salt	= Dodecyl sulfate, magnesium salt
Lauryl sulfate, sodium salt	= Dodecyl sulfate, sodium salt
Lauryl sulfate, triethanolamine salt	= Dodecyl sulfate, triethanolamine salt
Laurylbenzene	= Dodecylbenzene
Laurylbenzenesulfonic acid	= Dodecylbenzenesulfonic acid
Lead (II) chloride	= Lead chloride
Lead acetate trihydrate	= Lead acetate
Lead acetate	= Lead acetate
Lead alkyls	= Lead alkyls
Lead arsenate, acid	= Lead arsenate
Lead arsenate	= Lead arsenate
Lead bottoms	= Lead sulfate
Lead chloride	= Lead chloride
Lead dichloride	= Lead chloride
Lead difluoride	= Lead fluoride
Lead fluoborate	= Lead fluoroborate
Lead fluoride	= Lead fluoride
Lead fluoroborate solution	= Lead fluoroborate
Lead fluoroborate	= Lead fluoroborate
Lead hyposulfite	= Lead thiosulfate
Lead iodide	= Lead iodide
Lead IV acetate	= Lead tetraacetate
Lead monoxide	= Litharge
Lead nitrate	= Lead nitrate
Lead oxide yellow	= Litharge
Lead protoxide	= Litharge
Lead stearate	= Lead stearate
Lead sulfate	= Lead sulfate
Lead sulfide	= Lead sulfide
Lead sulfocyanate	= Lead thiocyanate
Lead tetraacetate	= Lead tetraacetate
Lead tetraethyl	= Tetraethyl lead
Lead tetramethyl	= Tetramethyl lead
Lead thiocyanate	= Lead thiocyanate
Lead thiosulfate	= Lead thiosulfate
Lead tungstate	= Lead tungstate
Lead wolframate	= Lead tungstate
Leaf lard	= Oils, edible: lard
Lemonene	= Diphenyl
Leucol	= Quinoline
Levepox hardener T3	= Pentaethylenehexamine
Lichenic acid	= Fumaric acid

SYNONYM	COMPOUND NAMES
Light naphtha	= Naphtha: solvent
Light naphtha	= Naphtha: VM & P
Light oil	= Oils, miscellaneous: coal tar
Limed wood rosin	= Calcium resinate
Limonene	= Dipentene
Lindane	= gamma-Benzene hexachloride
Linear alcohols	= Linear alcohols
Linseed oil	= Oils, miscellaneous: linseed
Liquamon 28	= Urea, ammonium nitrate soln (w/aqua ammonia)
Liquefied natural gas	= Liquefied natural gas
Liquefied petroleum gas	= Liquefied petroleum gas
Liquefied phenol	= Carbolic oil (mixture)
Liquid ammonia	= Ammonia, anhydrous
Liquid asphalt	= Asphalt blending stocks: roofers flux
Liquid asphalt	= Oils, miscellaneous: road
Liquid bleach	= Sodium hypochlorite
Liquid camphor	= Camphor oil
Liquid gum camphor	= Camphor oil
Liquid hydrogen	= Hydrogen
Liquid impure camphor	= Camphor oil
Liquid nitrogen	= Nitrogen
Liquid oxygen	= Oxygen
Liquid petrolatum	= Oils, miscellaneous: mineral
Litharge	= Litharge
Lithium aluminum hydride	= Lithium aluminum hydride
Lithium bichromate dihydrate	= Lithium bichromate
Lithium bichromate	= Lithium bichromate
Lithium chromate	= Lithium chromate
Lithium dichromate	= Lithium bichromate
Lithium hydride	= Lithium hydride
Lithium	= Lithium
LNG	= Liquefied natural gas
Long-time burning oil	= Oils, miscellaneous: mineral seal
Lorol-22	= n-Decyl alcohol
Lorsban	= Dursban
LOX	= Oxygen
LPG	= Liquefied petroleum gas
Lubricating oil	= Oils, miscellaneous: motor
Lucidol	= Dibenzoyl peroxide
Lumbrical	= Piperazine
Lunar caustic	= Silver nitrate
Luperco JDB-50-T	= Cyclohexanone peroxide
Lye	= Caustic potash solution
Lye	= Caustic soda solution
Lye	= Potassium hydroxide
Lye	= Sodium hydroxide
M-B-C fumigant	= Methyl bromide
MAA	= Methyl isobutyl carbinol
MAAC	= Methyl amyl acetate
Macquer's salt	= Potassium arsenate
Magnesium dodecyl sulfate	= Dodecyl sulfate, magnesium salt
Magnesium lauryl sulfate	= Dodecyl sulfate, magnesium salt
Magnesium nitrate hexahydrate	= Magnesium nitrate

SYNONYM	COMPOUND NAMES
Magnesium nitrate	= Magnesium nitrate
Magnesium perchlorate hexahydrate	= Magnesium perchlorate
Magnesium perchlorate, anhydrous	= Magnesium perchlorate
Magnesium perchlorate	= Magnesium perchlorate
Magnesium	= Magnesium
Malathion	= Malathion
Malazide	= Maleic hydrazide
Maleic acid hydrazide	= Maleic hydrazide
Maleic acid	= Maleic acid
Maleic anhydride	= Maleic anhydride
Maleic hydrazide	= Maleic hydrazide
Maleinic acid	= Maleic acid
Malenic acid	= Maleic acid
Malix	= Endosulfan
Malonic dinitrile	= Propanedinitrile
Malonic mononitrile	= Cyanoacetic acid
Malononitrile	= Propanedinitrile
MAOH	= Methyl amyl alcohol
MAOH	= Methyl isobutyl carbinol
MAPP gas	= Methyl acetylene, propadiene mixture
Marlate 50	= Methoxychlor
Marmer	= Diuron
Marsh gas	= Methane
Marshite	= Copper iodide
Massicot	= Litharge
MCB	= Chlorobenzene
MCP	= Calcium phosphate
MDEA	= Methyl diethanolamine
MDI	= Diphenylmethane diisocyanate
Meadow green	= Copper acetoarsenite
Mediben	= Dicamba
MEK	= Methyl ethyl ketone
MEKP	= 2-Butanone peroxide
Mendrin	= Endrin
Menite	= Phosdrin
p-Mentha-1,8-diene	= Dipentene
MEP	= Methylethylpyridine
Mercaptobenzene	= Benzenethiol
Mercaptodimethur	= Mercaptodimethur
Mercaptoethane	= Ethyl mercaptan
Mercaptomethane	= Methyl mercaptan
Mercurialin	= Methylamine
Mercurialin	= Methylamine solution
Mercuric acetate	= Mercuric acetate
Mercuric ammonium chloride	= Mercuric ammonium chloride
Mercuric chloride, ammoniated	= Mercuric ammonium chloride
Mercuric chloride	= Mercuric chloride
Mercuric cyanide	= Mercuric cyanide
Mercuric iodide, red	= Mercuric iodide
Mercuric iodide	= Mercuric iodide
Mercuric nitrate	= Mercuric nitrate
Mercuric oxide, red	= Mercuric oxide
Mercuric oxide, yellow	= Mercuric oxide
Mercuric oxide	= Mercuric oxide

SYNONYM	COMPOUND NAMES
Mercuric sulfate	= Mercuric sulfate
Mercuric sulfide, black	= Mercuric sulfide
Mercuric sulfide, red	= Mercuric sulfide
Mercuric sulfide	= Mercuric sulfide
Mercuric sulfocyanate	= Mercuric thiocyanate
Mercuric sulfocyanide	= Mercuric thiocyanate
Mercuric thiocyanate	= Mercuric thiocyanate
Mercurous chloride	= Mercurous chloride
Mercurous nitrate monohydrate	= Mercurous nitrate
Mercurous nitrate	= Mercurous nitrate
Mercury (II) chloride	= Mercuric chloride
Mercury (II) cyanide	= Mercuric cyanide
Mercury (II) nitrate	= Mercuric nitrate
Mercury (II) sulfate (1:1)	= Mercuric sulfate
Mercury amide chloride	= Mercuric ammonium chloride
Mercury ammonium chloride	= Mercuric ammonium chloride
Mercury bichloride	= Mercuric chloride
Mercury biniodide	= Mercuric iodide
Mercury bisulfate	= Mercuric sulfate
Mercury cyanide	= Mercuric cyanide
Mercury monochloride	= Mercurous chloride
Mercury nitrate monohydrate	= Mercuric nitrate
Mercury oxide	= Mercuric oxide
Mercury perchloride	= Mercuric chloride
Mercury pernitrate	= Mercuric nitrate
Mercury persulfate	= Mercuric sulfate
Mercury protochloride	= Mercurous chloride
Mercury protonitrate	= Mercurous nitrate
Mercury rhodanide	= Mercuric thiocyanate
Mercury subchloride	= Mercurous chloride
Mercury	= Mercury
Merex	= Kepone
Mesityl oxide	= Mesityl oxide
Mesuirol	= Mercaptodimethur
Metacetone	= Diethyl ketone
Metallic resinate	= Calcium resinate
Metelilachlor	= Metolachlor
Metelilachlor	= Metolachlor
Methacetone	= Diethyl ketone
Methacrylate monomer	= Methyl methacrylate
Methacrylic acid, 2, 3-epoxypropyl ester	= Glycidyl methacrylate
Methacrylic acid, butyl ester	= n-Butyl methacrylate
Methacrylic acid, butyl, decyl, cetyl and eicosyl ester mix	= Butyl, decyl, cetyl-eicosyl methacrylate
Methacrylic acid, dodecyl and pentadecyl ester mix	= Dodecyl/pentadecyl methacrylate
Methacrylic acid, dodecyl ester	= Dodecylmethacrylate
Methacrylic acid, ethyl ester	= Ethyl methacrylate
Methacrylic acid, isobutyl ester	= Isobutyl methacrylate
Methacrylic acid, lauryl and pentadecyl ester mix	= Dodecyl/pentadecyl methacrylate
Methacrylic acid, methyl ester	= Methyl methacrylate
Methacrylic acid	= Methacrylic acid
Methacrylonitrile	= Methacrylonitrile

**SYNONYM**

beta-Methallyl chloride  
Methallyl chloride  
Methanal solution  
Methanamide  
Methane, isocyanato-  
Methane, tribromo-  
Methane  
Methanearsonic acid, sodium salt  
Methaneethiol  
Methanethiomethane  
Methanoic acid, amide  
Methanoic acid  
4,7-Methanoindene, 3a,4,7,7a-tetrahydrodimethyl  
Methanol  
Metheneamine  
Methenyl tribromide  
Methiocarb  
Methionine hydroxy analog  
Methmercapturon  
2-Methoxy-2-methyl propane  
1-Methoxy-2-propanol acetate  
1-Methoxy-2-propanol  
Methoxy DDT  
o-Methoxybenzoic acid  
3-Methoxybutyl acetate  
Methoxychlor  
2-Methoxyethanol  
2-(2-Methoxyethoxy)-ethanol  
2-Methoxyethyl acetate  
Bis-(2-Methoxyethyl)-ether  
Methoxyethylene  
2,2-bis-(p-Methoxyphenyl)-1,1,1-trichloroethane  
3-Methyl-1-butanol  
3-Methyl-1-buten-3-ol  
2-Methyl-1-butene-3-one  
6-Methyl-1-heptanal  
6-Methyl-1-heptanol  
2-Methyl-1-pentene  
4-Methyl-1-pentene  
1-Methyl-1-phenylethylene  
2-Methyl-1-propanol  
2-Methyl-1-propyl acetate  
1-Methyl-1 propylethylene  
2-Methyl-1, 3-butadiene  
Methyl-1,3-butylene glycol acetate  
1-Methyl-2-(3-pyridyl)pyrrolidine  
3-Methyl-2-butanone  
2-Methyl-2-butynol  
1-Methyl-2-chlorobenzene  
1-Methyl-2-fluorobenzene  
2-Methyl-2-hydroxy-3-butyne  
1-Methyl-2-hydroxyethylamine

**COMPOUND NAMES**

= Methallyl chloride  
= Methallyl chloride  
= Formaldehyde solution  
= Formamide  
= Methyl isocyanate  
= Bromoform  
= Methane  
= Methanearsonic acid, sodium salt  
= Methyl mercaptan  
= Dimethyl sulfide  
= Formamide  
= Formic acid  
= Methylcyclopentadiene dimer  
  
= Methyl alcohol  
= Hexamethylenetetramine  
= Bromoform  
= Mercaptodimethur  
= 2-Hydroxy-4-(methylthio)-butanoic acid  
= Mercaptodimethur  
= Methyl tert-butyl ether  
= Propylene glycol methyl ether acetate  
= Propylene glycol methyl ether  
= Methoxychlor  
= Methyl salicylate  
= 3-Methoxybutyl acetate  
= Methoxychlor  
= Ethylene glycol monomethyl ether  
= Diethylene glycol monomethyl ether  
= Ethylene glycol methyl ether acetate  
= Diethylene glycol dimethyl ether  
= Vinyl methyl ether  
= Methoxychlor  
  
= Isoamyl alcohol  
= Methyl butenol  
= Methyl isopropenyl ketone  
= Isooctaldehyde  
= Isooctyl alcohol  
= 2-Methyl-1-pentene  
= 4-Methyl-1-pentene  
= alpha-Methylstyrene  
= Isobutyl alcohol  
= Isobutyl acetate  
= 2-Methyl-1-pentene  
= Isoprene  
= 3-Methoxybutyl acetate  
= Nicotine  
= 3-Methyl-2-butanone  
= 2-Methyl-2-hydroxy-3-butyne  
= o-Chlorotoluene  
= 2-Fluorotoluene  
= 2-Methyl-2-hydroxy-3-butyne  
= 2-Propanolamine

SYNONYM	COMPOUND NAMES
2-Methyl-2-methoxy propane	= Methyl tert-butyl ether
4-Methyl-2-pentanol acetate	= Methyl amyl acetate
4-Methyl-2-pentanol	= Methyl amyl alcohol
4-Methyl-2-pentanol	= Methyl isobutyl carbinol
4-Methyl-2-pentanone	= Methyl isobutyl ketone
4-Methyl-2-pentyl acetate	= Methyl amyl acetate
2-Methyl-2-propanol	= tert-Butyl alcohol
2-Methyl-2-propen-1-ol	= Methyl allyl alcohol
1-Methyl-2-pyrrolidinone	= 1-Methylpyrrolidone
3-(1-Methyl-2-pyrrolidyl)pyridine	= Nicotine
1-Methyl-2, 4-dinitrobenzene	= 2,4-Dinitrotoluene
2-Methyl-2,4-pentanediol	= Hexylene glycol
2-Methyl-3-buten-2-ol	= Methyl butenol
2-Methyl-3-butyne-2-ol	= Methyl butynol
1-Methyl-3-fluorobenzene	= 3-Fluorotoluene
Methyl-3-oxo-butyrate	= Methyl acetoacetate
4-Methyl-3-pentene-2-one	= Mesityl oxide
1-Methyl-4-isopropylbenzene	= p-Cymene
4-Methyl-4-pentene	= 2-Methyl-1-pentene
1-Methyl-4-tert-butylbenzene	= Butyl toluene
2-Methyl-6-ethyl aniline	= 2-Methyl-6-ethyl aniline
2-Methyl-6-ethylbenzeneamine	= 2-Methyl-6-ethyl aniline
2-Methyl-6-methylene-2,7-octadiene	= Myrcene
N-Methyl-alpha-pyrrolidone	= 1-Methylpyrrolidone
3-Methyl-buten-(1)-ol(3)	= Methyl butenol
Methyl-n-butanoate	= Methyl butyrate
Methyl-n-butyrate	= Methyl butyrate
p-Methyl-tert-butylbenzene	= Butyl toluene
Methyl 2-methyl-2-propenoate	= Methyl methacrylate
Methyl 2-propenoate	= Methyl acrylate
Methyl a-methylacrylate	= Methyl methacrylate
Methyl acetaldehyde	= Propionaldehyde
Methyl acetate	= Methyl acetate
Methyl acetoacetate	= Methyl acetoacetate
Methyl acetylacetonate	= Methyl acetoacetate
Methyl acetylene, propadiene mixture	= Methyl acetylene, propadiene mixture
Methyl acrylate	= Methyl acrylate
Methyl adipate	= Dimethyl adipate
Methyl alcohol	= Methyl alcohol
Methyl allyl alcohol	= Methyl allyl alcohol
Methyl amyl acetate	= Methyl amyl acetate
Methyl amyl alcohol	= Methyl amyl alcohol
Methyl amyl ketone	= n-Amyl methyl ketone
alpha-Methyl benzene methanol	= a-Methylbenzyl alcohol
Methyl benzenecarboxylate	= Methyl benzoate
Methyl benzoate	= Methyl benzoate
Methyl bromide	= Methyl bromide
3-Methyl butan-2-one	= 3-Methyl-2-butanone
Methyl butenol	= Methyl butenol
Methyl butynol	= 2-Methyl-2-hydroxy-3-butyne
Methyl butynol	= Methyl butynol
Methyl butyrate	= Methyl butyrate
Methyl carbitol acetate	= Diethylene glycol methyl ether acetate
Methyl carbitol	= Diethylene glycol monomethyl ether

SYNONYM	COMPOUND NAMES
Methyl carbonimide	= Methyl isocyanate
Methyl cellosolve acetate	= Ethylene glycol methyl ether acetate
Methyl cellosolve	= Ethylene glycol monomethyl ether
Methyl chloride	= Methyl chloride
Methyl chloroacetate	= Methyl chloroacetate
Methyl chlorocarbonate	= Methyl chloroformate
Methyl chloroformate	= Methyl chloroformate
Methyl chloromethyl ether, anhydrous	= Chloromethyl methyl ether
Methyl cyanide	= Acetonitrile
Methyl cyclopentane	= Methyl cyclopentane
Methyl dichloroacetate	= Methyl dichloroacetate
Methyl dichloroethanoate	= Methyl dichloroacetate
Methyl diethanolamine	= Methyl diethanolamine
N-Methyl ethanolamine	= Monomethyl ethanolamine
Methyl ether	= Dimethyl ether
Methyl ethyl bromo-methane	= 2-Bromobutane
Methyl ethyl ketone	= Methyl ethyl ketone
Methyl formal	= Methyl formal
Methyl formate	= Methyl formate
Methyl heptyl ketone	= Methyl heptyl ketone
Methyl iodide	= Methyl iodide
Methyl isobutenyl ketone	= Mesityl oxide
Methyl isobutyl carbinol	= Methyl isobutyl carbinol
Methyl isobutyl ketone	= Methyl isobutyl ketone
Methyl isocyanate	= Methyl isocyanate
Methyl isopropenyl ketone	= Methyl isopropenyl ketone
Methyl isopropyl ketone	= 3-Methyl-2-butanone
Methyl isothiocyanate	= Methyl isothiocyanate
Methyl mercaptan	= Methyl mercaptan
Methyl methacrylate	= Methyl methacrylate
Methyl monochloroacetate	= Methyl chloroacetate
Methyl mustard oil	= Methyl isothiocyanate
Methyl n-amyl ketone	= Methylamyl ketone
Methyl n-butyl ketone	= Methyl n-butyl ketone
Methyl n-propyl ketone	= 2-Pentanone
2-Methyl nitrobenzene	= o-Nitrotoluene
Methyl nitrobenzene	= p-Nitrotoluene
Methyl parathion	= Methyl parathion
2-Methyl pentene-1	= 2-Methyl-1-pentene
Methyl pentyl ketone	= n-Amyl methyl ketone
Methyl phenyl ketone	= Acetophenone
Methyl phosphite	= Trimethyl phosphite
Methyl phosphonothioic dichloride	= Methyl phosphonothioic dichloride
Methyl phthalate	= Dimethyl phthalate
2-Methyl propenic acid	= Methacrylic acid
Methyl propyl ketone	= Methyl propyl ketone
Methyl salicylate	= Methyl salicylate
Methyl sulfate	= Dimethyl sulfate
Methyl sulfhydrate	= Methyl mercaptan
Methyl sulfide	= Dimethyl sulfide
Methyl sulfoxide	= Dimethyl sulfoxide
Methyl tert-butyl ether	= Methyl tert-butyl ether
Methyl thiram	= Thiram
Methyl tribromide	= Bromoform

SYNONYM	COMPOUND NAMES
Methyl tuads	= Thiram
Methyl vinyl ether	= Vinyl methyl ether
Methyl vinyl ketone	= Methyl vinyl ketone
Methylacetic acid	= Propionic acid
Methylacetic anhydride	= Propionic anhydride
Methylacetylene-allene mixture	= Methyl acetylene, propadiene mixture
beta-Methylacrolein	= Crotonaldehyde
alpha-Methylacrylic acid	= Methacrylic acid
2-Methylacrylic acid	= Methacrylic acid
2-Methylactonitrile	= Acetone cyanohydrin
Methylal	= Methyl formal
beta-Methylallyl chloride	= Methallyl chloride
Methylamine solution	= Methylamine solution
Methylamine	= Methylamine
2-(Methylamino)ethanol	= Monomethyl ethanolamine
N-Methylaminobenzene	= N-Methylaniline
Methylamyl alcohol	= Methyl isobutyl carbinol
Methylamyl ketone	= Methylamyl ketone
Methylaniline (mono)	= N-Methylaniline
m-Methylaniline	= m-Toluidine
3-Methylaniline	= m-Toluidine
N-Methylaniline	= N-Methylaniline
2-Methylaniline	= o-Toluidine
o-Methylaniline	= o-Toluidine
p-Methylaniline	= p-Toluidine
4-Methylaniline	= p-Toluidine
2-Methylaziridine	= Propyleneimine
Methylbenzene	= Toluene
3-Methylbenzeneamine	= m-Toluidine
4-Methylbenzeneamine	= p-Toluidine
Methylbenzenesulfonic acid	= p-Toluenesulfonic acid
Methylbenzol	= Toluene
a-Methylbenzyl alcohol	= a-Methylbenzyl alcohol
alpha-Methylbivinyll	= 1,3-Pentadiene
beta-Methylbivinyll	= Isoprene
1-Methylbutadiene	= 1,3-Pentadiene
3-Methylbutanal	= Isovaleraldehyde
2-Methylbutane	= Isopentane
3-Methylbutyl nitrite	= iso-Amyl nitrite
3-Methylbutyraldehyde	= Isovaleraldehyde
Methylcarbamate	= Carbofuran
Methylchloroform	= Trichloroethane
Methylcyclohexane	= Methylcyclohexane
2-Methylcyclohexanol	= 2-Methylcyclohexanol
o-Methylcyclohexanone	= o-Methylcyclohexanone
2-Methylcyclohexanone	= o-Methylcyclohexanone
Methylcyclopentadiene dimer	= Methylcyclopentadiene dimer
Methylcyclopentadienylmanganese tricarbonyl	= Methylcyclopentadienylmanganese tricarbonyl
Methyldichlorosilane	= Methyldichlorosilane
3-Methylene-7-methyl 1,6-octadiene	= Myrcene
Methylene bromide	= Dibromomethane
Methylene chloride	= Dichloromethane
Methylene cyanide	= Propanedinitrile



SYNONYM	COMPOUND NAMES
Methylene dibromide	= Dibromomethane
Methylene dichloride	= Dichloromethane
Methylene dimethyl ether	= Methyl formal
Methylene tribromide	= Bromoform
2,2-Methylene, bis[3,4,6-trichlorophenol]	= Hexachlorophene
bis-(1-Methylethyl)-benzene	= Diisopropylbenzene (all isomers)
bis-(1-Methylethyl) ester	= Isopropyl percarbonate
o-Methylethylbenzene	= 2-Ethyl toluene
Methylethylcarbinol	= sec-Butyl alcohol
1-Methylethylcyclohexane	= Isopropyl cyclohexane
Methylethylene glycol	= Propylene glycol
Methylethylene	= Propylene
2-Methylethyleneimine	= Propyleneimine
Methylethylketone peroxide	= 2-Butanone peroxide
Methylethylpyridine	= Methylethylpyridine
Bis-(6-Methylheptyl) phthalate	= Diisooctyl phthalate
Methylhydrazine	= Methylhydrazine
p-Methylhydroxybenzene	= p-Cresol
2,2'-Methyliminodiethanol	= Methyl diethanolamine
Methylisobutylcarbinol	= Methyl amyl alcohol
Methylisobutylcarbonyl acetate	= Methyl amyl acetate
Methylmethane	= Ethane
alpha-Methylnaphthalene	= 1-Methylnaphthalene
1-Methylnaphthalene	= 1-Methylnaphthalene
3-Methylnitrobenzene	= m-Nitrotoluene
4-Methylnitrobenzene	= p-Nitrotoluene
Methyloxirane	= Propylene oxide
2-Methylpentane	= Isohexane
Methylphenols	= Cresols
m-Methylphenol	= m-Cresol
2-Methylphenol	= o-Cresol
p-Methylphenol	= p-Cresol
Methylphenyl methanol	= a-Methylbenzyl alcohol
Methylphenylamine	= N-Methylaniline
2-Methylpropanal	= iso-butyraldehyde
2-Methylpropane	= Isobutane
2-Methylpropanenitrile	= Isobutyronitrile
2-Methylpropanoic acid	= Isobutyric acid
2-Methylpropene	= Isobutylene
alpha-Methylpropionic acid	= Isobutyric acid
2-Methylpropionitrile	= Isobutyronitrile
beta-Methylpropyl ethanoate	= Isobutyl acetate
N,N-bis(2-Methylpropyl)amine	= Diisobutylamine
Methylpropylbenzene	= p-Cymene
2-Methylpyridine	= 2-Methylpyridine
alpha-Methylpyridine	= 2-Methylpyridine
3-Methylpyridine	= 3-Methylpyridine
4-Methylpyridine	= 4-Methylpyridine
N-Methylpyrrolidinone	= 1-Methylpyrrolidone
N-Methylpyrrolidone	= 1-Methylpyrrolidone
1-Methylpyrrolidone	= 1-Methylpyrrolidone
alpha-Methylstyrene	= alpha-Methylstyrene
p-Methylstyrene	= Vinyl toluene
4-(Methylsulfonyl)-2,6-dinitro	= Nitralin

SYNONYM	COMPOUND NAMES
Methyltrichlorosilane	= Methyltrichlorosilane
Methylzinc	= Dimethylzinc
Metolachlor	= Metolachlor
Metron	= Methyl parathion
Mevinphos	= Phosdrin
Mexacarbate	= Zectran
MFB	= Fluorobenzene
MHA-FA	= 2-Hydroxy-4-(methylthio)-butanoic acid
MHA acid	= 2-Hydroxy-4-(methylthio)-butanoic acid
MIBC	= Methyl isobutyl carbinol
MIBK	= Methyl isobutyl ketone
MIC	= Methyl amyl alcohol
MIC	= Methyl isobutyl carbinol
MIC	= Methyl isocyanate
Middle oil	= Carbolic oil (mixture)
MIK	= Methyl isobutyl ketone
Mild mercury chloride	= Mercurous chloride
Milk acid	= Lactic acid
Milk white	= Lead sulfate
Milocep	= Metolachlor
Mineral carbon	= Charcoal
Mineral colza oil	= Oils, miscellaneous: mineral seal
Mineral spirits	= Mineral spirits
Mipax	= Dimethyl phthalate
Mirex	= Mirex
Mitis green	= Copper acetoarsenite
Mixed fertilizers	= Ammonium nitrate-sulfate mixture
Mixed primary amyl nitrates	= n-Amyl nitrate
Mixture of benzene, toluene, xylenes	= Naphtha: coal tar
MMH	= Methylhydrazine
Mohr's salt	= Ferrous ammonium sulfate
Molybdenum trioxide	= Molybdic trioxide
Molybdic acid (85%)	= Ammonium molybdate
Molybdic anhydride	= Molybdic trioxide
Molybdic trioxide	= Molybdic trioxide
Mondur TDS	= Toluene 2,4-diisocyanate
Mono-n-propylamine	= n-Propylamine
Mono PE	= Pentaerythritol
Monoammonium orthophosphate	= Ammonium phosphate
Monobromoacetone	= Bromoacetone
Monobromobenzene	= Bromobenzene
Monobromomethane	= Methyl bromide
Monocalcium phosphate monohydrate	= Calcium phosphate
Monochlorethane	= Ethyl chloride
Monochlorethanoic acid, ethyl ester	= Ethyl chloroacetate
Monochloroacetaldehyde	= Chloroacetaldehyde
Monochloroacetic acid, methyl ester	= Methyl chloroacetate
Monochloroacetic acid	= Chloroacetic acid
Monochloroacetic acid	= Chloroacetic acid (80% or less)
Monochlorobenzene	= Chlorobenzene
Monochlorodifluoromethane	= Chlorodifluoromethane
Monochloromethyl ether	= Chloromethyl methyl ether
beta-Monochloropropionic acid	= 3-Chloropropionic acid
Monochlorotetrafluoroethane	= Monochlorotetrafluoroethane

SYNONYM	COMPOUND NAMES
Monochlorotrifluoromethane	= Monochlorotrifluoromethane
Monoethanolamine	= Monoethanolamine
Monoethylamine	= Ethylamine
Monoethylene glycol	= Ethylene glycol
Monofluorobenzene	= Fluorobenzene
Monofluoroethylene	= Vinyl fluoride
Monoglyme	= Ethylene glycol dimethyl ether
Monoiodomethane	= Methyl iodide
Monoisobutylamine	= Isobutylamine
Monoisopropanolamine	= Monoisopropanolamine
Monoisopropylamine	= Isopropylamine
Monomethyl ethanolamine	= Monomethyl ethanolamine
Monomethylamine	= Methylamine
Monomethylamine	= Methylamine solution
Monomethylhydrazine	= Methylhydrazine
Mononitrogen monoxide	= Nitric oxide
Monosodium methane arsonate	= Methanearsonic acid, sodium salt
Monosodium methyl arsonate	= Methanearsonic acid, sodium salt
Monoxide	= Carbon monoxide
Morpholine	= Morpholine
Mortopal	= Tetraethyl pyrophosphate
Moss green	= Copper acetoarsenite
Motor oil	= Oils, miscellaneous: lubricating
Motor spirit	= Gasolines: automotive (<4.23g lead/gal)
Mouse-tox	= Strychnine
MPT	= Methyl parathion
MPTD	= Methyl phosphonothioic dichloride
MSMA	= Methanearsonic acid, sodium salt
Multrathane M	= Diphenylmethane diisocyanate
Muriatic acid	= Hydrochloric acid
Myrcene	= Myrcene
Myristic alcohol	= Tetradecanol
Myristyl alcohol	= Tetradecanol
NA 1760 (DOT)	= Hexanoic acid
Nabam	= Nabam
Nacap	= Sodium 2-mercaptobenzothiazol solution
Naccanol NR or SW	= Dodecyl benzene sulfonic acid, sodium salt
Nacconate 100	= Toluene 2,4-diisocyanate
Nacconate 300	= Diphenylmethane diisocyanate
Nacconol 988 A	= Dodecylbenzenesulfonic acid
Nadone	= Cyclohexanone
Naled	= Naled
Naphtha: coal tar	= Naphtha: coal tar
Naphtha: solvent	= Naphtha: solvent
Naphtha: stoddard solvent	= Naphtha: stoddard solvent
Naphtha: VM & P	= Naphtha: VM & P
Naphtha	= Mineral spirits
Naphthalene	= Naphthalene
Naphthalin	= Naphthalene
Naphthane	= Decahydronaphthalene
Naphthenic acids	= Naphthenic acids
1-Naphthyl n-methylcarbamate	= Carbaryl
alpha-Naphthylamine	= 1-Naphthylamine

SYNONYM	COMPOUND NAMES
1-Naphthylamine	= 1-Naphthylamine
Naphtol as-kg	= p-Toluidine
Napthalane	= Decahydronaphthalene
Natural gas	= Methane
Natural gasoline	= Gasolines: casinghead
Naugatuck DO 14	= Propargite
NCI-C 54773	= Dimethyl hydrogen phosphite
NCI-C06155	= Butyl chloride
NCI-C06508	= Benzyl acetate
NCI - C55947	= Tetranitromethane
NCL-C56188	= 2,6-Dimethylaniline
Necatorina	= Carbon tetrachloride
Neo-fat 10	= Decanoic acid
Neo-fat 12-43	= Lauric acid
Neo-fat 8	= Octanoic acid
Neodecanoic acid, vinyl ester	= Vinyl neodecanoate
Neodecanoic acid	= Neodecanoic acid
Neofat 12	= Lauric acid
Neohexane	= Neohexane
Neol	= 2,2-Dimethylpropane-1,3-diol
Neopentanoic acid	= Trimethylacetic acid
Neopentyl glycol	= 2,2-Dimethylpropane-1,3-diol
Neopentylene glycol	= 2,2-Dimethylpropane-1,3-diol
Nerkol	= Dichlorvos
Neutral ammonium chromate	= Ammonium chromate
Neutral ammonium fluoride	= Ammonium fluoride
Neutral anhydrous calcium hypochlorite	= Calcium hypochlorite
Neutral lead acetate	= Lead acetate
Neutral lead stearate	= Lead stearate
Neutral nicotine sulfate	= Nicotine sulfate
Neutral potassium chromate	= Potassium chromate
Neutral sodium chromate anhydrous	= Sodium chromate
Neutral verdigris	= Copper acetate
NIA 12 40	= Ethion
NIA 5996	= Dichlobenil
Niagara 10242	= Carbofuran
Nialate	= Ethion
Nickel (II) fluoborate	= Nickel fluoroborate
Nickel acetate tetrahydrate	= Nickel acetate
Nickel acetate	= Nickel acetate
Nickel ammonium sulfate hexahydrate	= Nickel ammonium sulfate
Nickel ammonium sulfate	= Nickel ammonium sulfate
Nickel bromide trihydrate	= Nickel bromide
Nickel bromide	= Nickel bromide
Nickel carbonyl	= Nickel carbonyl
Nickel chloride hexahydrate	= Nickel chloride
Nickel chloride	= Nickel chloride
Nickel cyanide	= Nickel cyanide
Nickel dihydroxide	= Nickel hydroxide
Nickel fluoroborate solution	= Nickel fluoroborate
Nickel fluoroborate	= Nickel fluoroborate
Nickel formate dihydrate	= Nickel formate
Nickel formate	= Nickel formate
Nickel hydroxide	= Nickel hydroxide

SYNONYM	COMPOUND NAMES
Nickel nitrate hexahydrate	= Nickel nitrate
Nickel nitrate	= Nickel nitrate
Nickel sulfate	= Nickel sulfate
Nickel tetracarbonyl	= Nickel carbonyl
Nickelous acetate	= Nickel acetate
Nickelous hydroxide	= Nickel hydroxide
Nickelous sulfate	= Nickel sulfate
Nicotine sulfate	= Nicotine sulfate
Nicotine	= Nicotine
Niobe oil	= Methyl benzoate
Nitos	= Tetraethyl pyrophosphate
Nitralin	= Nitralin
Nitram	= Ammonium nitrate
Nitran	= Methyl parathion
o-Nitraniline	= 2-Nitroaniline
Nitratine	= Sodium nitrate
Nitrex nitrogen solutions (non-pressure)	= Ammonium nitrate-urea solution
Nitric acid, aluminum salt	= Aluminum nitrate
Nitric acid, iron(III) salt	= Ferric nitrate
Nitric acid, lead II salt	= Lead nitrate
Nitric acid, thallium (I) salt	= Thallium nitrate
Nitric acid, thallos salt	= Thallium nitrate
Nitric acid	= Nitric acid
Nitric oxide	= Nitric oxide
Nitrilotriacetic acid and salts	= Nitrilotriacetic acid and salts
2-Nitroaniline	= 2-Nitroaniline
o-Nitroaniline	= 2-Nitroaniline
p-Nitroaniline	= 4-Nitroaniline
4-Nitroaniline	= 4-Nitroaniline
Nitrobenzene	= Nitrobenzene
Nitrobenzol	= Nitrobenzene
Nitrocarbol	= Nitromethane
Nitrocellulose gum	= Collodion
Nitrocellulose solution	= Collodion
o-Nitrochlorobenzene	= o-Chloronitrobenzene
Nitrochloroform	= Chloropicrin
Nitroethane	= Nitroethane
Nitrogen dioxide	= Nitrogen tetroxide
Nitrogen monoxide	= Nitric oxide
Nitrogen peroxide	= Nitrogen tetroxide
Nitrogen tetroxide	= Nitrogen tetroxide
Nitrogen	= Nitrogen
Nitromagnesite	= Magnesium nitrate
Nitromethane	= Nitromethane
o-Nitrophenol	= 2-Nitrophenol
2-Nitrophenol	= 2-Nitrophenol
3-Nitrophenol	= 3-Nitrophenol
m-Nitrophenol	= 3-Nitrophenol
p-Nitrophenol	= 4-Nitrophenol
4-Nitrophenol	= 4-Nitrophenol
1-Nitropropane	= 1-Nitropropane
2-Nitropropane	= 2-Nitropropane
sec-Nitropropane	= 2-Nitropropane
Nitrosyl chloride	= Nitrosyl chloride

SYNONYM	COMPOUND NAMES
3-Nitrotoluene	= m-Nitrotoluene
m-Nitrotoluene	= m-Nitrotoluene
o-Nitrotoluene	= o-Nitrotoluene
2-Nitrotoluene	= o-Nitrotoluene
p-Nitrotoluene	= p-Nitrotoluene
3-Nitrotoluol	= m-Nitrotoluene
4-Nitrotoluol	= p-Nitrotoluene
Nitrotrichloromethane	= Chloropicrin
Nitrous ether	= Ethyl nitrite
Nitrous oxide	= Nitrous oxide
No. 4	= Oils, fuel: 4
No. 5	= Oils, fuel: 5
No. 6	= Oils, fuel: no. 6
Nonan-2-one	= Methyl heptyl ketone
Nonane	= Nonane
n-Nonane	= Nonane
Nonanol acetate	= Nonyl acetate
Nonanol	= Nonanol
1-Nonanol	= Nonanol
5-Nonanone	= Di-n-butyl ketone
2-Nonanone	= Methyl heptyl ketone
Nonene (non-linear)	= Nonene
Nonene (nonlinear)	= Propylene trimer
1-Nonene	= 1-Nonene
Nonene	= Nonene
Nonene	= Propylene trimer
Nonyl acetate	= Nonyl acetate
n-Nonyl acetate	= Nonyl acetate
Nonyl alcohol/pelargonic alcohol	= Nonanol
Nonyl alcohol	= Nonanol
Nonylcarbinol	= n-Decyl alcohol
1-Nonylene	= 1-Nonene
n-Nonylethylene	= 1-Undecene
Nonylphenol	= Nonylphenol
S-Noranone	= Di-n-butyl ketone
Normal lead acetate	= Lead acetate
Normenthane	= Isopropyl cyclohexane
Norvalamine	= n-Butylamine
2-NP	= 2-Nitropropane
NTA	= Nitritotriacetic acid and salts
NTM	= Dimethyl phthalate
Nuoplaz	= Ditridecyl phthalate
Nux-vomica	= Strychnine
O,O-Diethyl O-(p-nitrophenyl) phosphorothioate	= Parathion
O,O[diethyl-o(and 5)-]2- (ethylthio)ethyl[phosphorothioate s	= Demeton
Octa-klor	= Chlordane
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a- hexahydro-4,7-methanoindene	= Chlordane
Octachlorocamphene	= Toxaphene
Octadecanoic acid	= Stearic acid
cis-9-Octadecenoic acid	= Oleic acid

SYNONYM	COMPOUND NAMES
n-Octadecylic acid	= Stearic acid
1,6-Octadiene, 7-methyl-3-methylene	= Myrcene
1-Octanal	= Octyl aldehydes
Octane	= Octane
n-Octane	= Octane
Octanoic acid	= Octanoic acid
Octanol	= Octanol
1-Octanol	= Octanol
3-Octanone	= Ethyl amyl ketone
1-Octene	= 1-Octene
n-Octoic acid	= Octanoic acid
Octoil	= Dioctyl phthalate
Octycarbinol	= Nonanol
n-Octyl-n-decyl phthalate	= Octyl decyl phthalate
Octyl acetate	= 2-Ethylhexyl acetate
Octyl alcohol	= Octanol
Octyl aldehyde	= Ethylhexaldehyde
n-Octyl aldehyde	= Octyl aldehydes
Octyl aldehydes	= Octyl aldehydes
Octyl decyl phthalate	= Octyl decyl phthalate
Octyl epoxy tallate	= Octyl epoxy tallate
alpha-Octylene	= 1-Octene
Oil of bitter almond	= Benzaldehyde
Oil of cashew nutshell	= Oil, misc: cashew nut shell
Oil of mirbane	= Nitrobenzene
Oil of Niobe	= Methyl benzoate
Oil of vitriol	= Sulfuric acid
Oil, misc: cashew nut shell	= Oil, misc: cashew nut shell
Oil, misc: pine	= Oil, misc: pine
Oils, edible: castor	= Oils, edible: castor
Oils, edible: coconut	= Oils, edible: coconut
Oils, edible: cottonseed	= Oils, edible: cottonseed
Oils, edible: fish	= Oils, edible: fish
Oils, edible: lard	= Oils, edible: lard
Oils, edible: olive	= Oils, edible: olive
Oils, edible: palm	= Oils, edible: palm
Oils, edible: peanut	= Oils, edible: peanut
Oils, edible: safflower	= Oils, edible: safflower
Oils, edible: soya bean	= Oils, edible: soya bean
Oils, edible: tucum	= Oils, edible: tucum
Oils, edible: vegetable	= Oils, edible: vegetable
Oils, fuel: 1-D	= Oils, fuel: 1-D
Oils, fuel: 2-D	= Oils, fuel: 2-D
Oils, fuel: 2	= Oils, fuel: 2
Oils, fuel: 4	= Oils, fuel: 4
Oils, fuel: 5	= Oils, fuel: 5
Oils, fuel: no. 1	= Oils, fuel: no. 1
Oils, fuel: no. 6	= Oils, fuel: no. 6
Oils, miscellaneous: absorption	= Oils, miscellaneous: absorption
Oils, miscellaneous: coal tar	= Oils, miscellaneous: coal tar
Oils, miscellaneous: croton	= Oils, miscellaneous: croton
Oils, miscellaneous: linseed	= Oils, miscellaneous: linseed
Oils, miscellaneous: lubricating	= Oils, miscellaneous: lubricating
Oils, miscellaneous: mineral seal	= Oils, miscellaneous: mineral seal

**SYNONYM**

Oils, miscellaneous: mineral  
Oils, miscellaneous: motor  
Oils, miscellaneous: neatsfoot  
Oils, miscellaneous: penetrating  
Oils, miscellaneous: range  
Oils, miscellaneous: resin  
Oils, miscellaneous: road  
Oils, miscellaneous: rosin  
Oils, miscellaneous: sperm  
Oils, miscellaneous: spindle  
Oils, miscellaneous: spray  
Oils, miscellaneous: tall  
Oils, miscellaneous: tanner's  
Oils, miscellaneous: transformer  
Oils, miscellaneous: turbine  
Oils: clarified  
Oils: crude  
Oils: diesel  
Olefiant gas  
Oleic acid, ammonium salt  
Oleic acid, potassium salt  
Oleic acid, sodium salt  
Oleic acid  
Oleum abietis  
Oleum  
Omal  
Omite  
ONA  
ONP  
Ontrack 8e  
Orpiment  
Orthoarsenic acid  
Orthoboric acid  
Orthocide  
Orthophosphoric acid  
Orthotitanic acid, tetrabutyl ester  
3-Oxa-1, 5-pentanediol  
Oxacetic acid  
Oxacyclopentadiene  
Oxal  
Oxaldehyde  
Oxalic acid dinitrile  
Oxalic acid, diammonium salt  
Oxalic acid, ferrous salt  
Oxalic acid  
Oxalonitrile  
Oxammonium sulfate  
Oxammonium  
2-Oxetanone  
Oxidate LE  
Oxides of nitrogen  
Oxirane  
Oxo octaldehyde  
Oxo octyl alcohol

**COMPOUND NAMES**

= Oils, miscellaneous: mineral  
= Oils, miscellaneous: motor  
= Oils, miscellaneous: neatsfoot  
= Oils, miscellaneous: penetrating  
= Oils, miscellaneous: range  
= Oils, miscellaneous: resin  
= Oils, miscellaneous: road  
= Oils, miscellaneous: rosin  
= Oils, miscellaneous: sperm  
= Oils, miscellaneous: spindle  
= Oils, miscellaneous: spray  
= Oils, miscellaneous: tall  
= Oils, miscellaneous: tanner's  
= Oils, miscellaneous: transformer  
= Oils, miscellaneous: turbine  
= Oils: clarified  
= Oils: crude  
= Oils: diesel  
= Ethylene  
= Ammonium oleate  
= Oleic acid, potassium salt  
= Oleic acid, sodium salt  
= Oleic acid  
= Oil, misc: pine  
= Oleum  
= Trichlorophenol  
= Propargite  
= 2-Nitroaniline  
= 2-Nitrophenol  
= Metolachlor  
= Arsenic trisulfide  
= Arsenic acid  
= Boric acid  
= Captan  
= Phosphoric acid  
= Tetrabutyl titanate  
= Diethylene glycol  
= Glyoxylic acid (50% or less)  
= Furan  
= Glyoxal  
= Glyoxal  
= Cyanogen  
= Ammonium oxalate  
= Ferrous oxalate  
= Oxalic acid  
= Cyanogen  
= Hydroxylamine sulfate  
= Hydroxylamine  
= beta-Propiolactone  
= Methyl benzoate  
= Nitrogen tetroxide  
= Ethylene oxide  
= Isooctaldehyde  
= Isooctyl alcohol



SYNONYM	COMPOUND NAMES
3-Oxobutanoic acid methyl ester	= Methyl acetoacetate
alpha-Oxodiphenylmethane	= Benzophenone
alpha-Oxoditane	= Benzophenone
Oxoethanoic acid	= Glyoxylic acid (50% or less)
2-Oxohexamethylenimine	= Caprolactam
Oxole	= Furan
Oxotridecyl alcohol	= Tridecanol
1,1'-[Oxybis(methylene)] bis benzene	= Dibenzyl ether
2,2'-Oxybisethanol	= Diethylene glycol
Oxygen	= Oxygen
Oxylite	= Dibenzoyl peroxide
Oxyphenic acid	= Catechol
Oxytoluenes	= Cresols
Paint drier	= Copper naphthenate
Painter's naphtha	= Naphtha: VM & P
Palm butter	= Oils, edible: palm
Palm fruit oil	= Oils, edible: palm
Palm oil	= Oils, edible: palm
Palm seed oil	= Oils, edible: tucum
PAN	= Phthalic anhydride
Paper maker's alum	= Aluminum sulfate solution
PAPI	= Polymethylene polyphenyl isocyanate
Paracetaldehyde	= Paraldehyde
Paradi	= p-Dichlorobenzene
Paradichlorobenzene	= p-Dichlorobenzene
Paradow	= p-Dichlorobenzene
Paraformaldehyde	= Paraformaldehyde
Paraldehyde	= Paraldehyde
Paramoth	= p-Dichlorobenzene
Paranaphthalene	= Anthracene
Parathion-methyl	= Methyl parathion
Parathion	= Parathion
Paridol	= Methyl parathion
Paris green	= Copper acetoarsenite
Parrot green	= Copper acetoarsenite
Patent aluminum	= Aluminum sulfate
PCB	= Polychlorinated biphenyl
PE	= Pentaerythritol
Pear oil	= Isoamylacetate
Pear oil	= sec-Amyl acetate
Pearl white	= Bismuth oxychloride
Penta-1,4-diene	= 1,4-Pentadiene
Penta	= Pentachlorophenol
Pentaborane	= Pentaborane
(9)-Pentaboron nonahydride	= Pentaborane
Pentachloroethane	= Pentachloroethane
Pentachlorophenol	= Pentachlorophenol
Pentachlorophenyl chloride	= Hexachlorobenzene
o-Pentadecadienyl salicylic acid	= Oil, misc: cashew nut shell
Pentadecanol	= Linear alcohols
Pentadecanol	= Pentadecanol
1-Pentadecanol	= Pentadecanol
Pentadecyl alcohol	= Pentadecanol
trans-Pentadiene-1,3	= 1,3-Pentadiene

SYNONYM	COMPOUND NAMES
cis-Pentadiene-1,3	= 1,3-Pentadiene
1,3-Pentadiene	= 1,3-Pentadiene
1,4-Pentadiene	= 1,4-Pentadiene
Pentaerythrite	= Pentaerythritol
Pentaerythritol	= Pentaerythritol
Pentaethylene hexamine	= Pentaethylenehexamine
Pentaethylenehexamine	= Pentaethylenehexamine
Pentalin	= Pentachloroethane
Pentamethylene	= Cyclopentane
Pentanal	= n-Valeraldehyde
Pentanal	= Valeraldehyde
Pentane	= Pentane
1,5-Pentanedial	= Glutaraldehyde solution
2,4-Pentanedione	= Acetylacetone
1-Pentanethiol	= n-Amyl mercaptan
Pentanoic acid	= Pentanoic acid
1-Pentanol	= n-Amyl alcohol
2-Pentanone	= 2-Pentanone
3-Pentanone	= Diethyl ketone
2-Pentanone	= Methyl propyl ketone
Pentek	= Pentaerythritol
1-Pentene	= 1-Pentene
tert-Pentyl acetate	= tert-Amyl acetate
Pentyl acetates	= Amyl acetate (all isomers)
Pentyl alcohol	= n-Amyl alcohol
1-Pentyl chloride	= n-Amyl chloride
Pentyl methyl ketone	= n-Amyl methyl ketone
n-Pentyl propionate	= n-Pentyl propionate
2-Pentylacetate	= sec-Amyl acetate
2-Pentylbromide	= 2-Bromopentane
sec-Pentylcarbinol	= Ethyl butanol
Pentylformic acid	= Hexanoic acid
Pentylsilicon trichloride	= n-Amyltrichlorosilane
Peracetic acid	= Peracetic acid
Percarbamide	= Urea peroxide
Perchloric acid solution	= Perchloric acid
Perchloric acid	= Perchloric acid
Perchlorobenzene	= Hexachlorobenzene
Perchlorobutadiene	= Hexachlorobutadiene
Perchlorocyclopentadiene	= Hexachlorocyclopentadiene
Perchlorodihomocubane	= Mirex
Perchloroethane	= Hexachloroethane
Perchloroethylene	= Tetrachloroethylene
Perchloromethane	= Carbon tetrachloride
Perchloromethyl mercaptan	= Perchloromethyl mercaptan
Perclene	= Tetrachloroethylene
Perhydronapthalene	= Decahydronaphthalene
Perk	= Tetrachloroethylene
Peroxide	= Hydrogen peroxide
Peroxyacetic acid	= Peracetic acid
Peroxydicarbonic acid,	= Isopropyl percarbonate
Peroxydisulfuric acid, diammonium salt	= Ammonium persulfate
Persian-insect powder	= Pyrethrins
Petrohol	= Isopropyl alcohol

SYNONYM	COMPOUND NAMES
Petrol	= Gasolines: automotive (<4.23g lead/gal)
Petrolatum jelly	= Petrolatum
Petrolatum	= Petrolatum
Petroleum asphalt	= Asphalt
Petroleum asphalt	= Oils, miscellaneous: road
Petroleum distillate	= Distillates: flashed feed stocks
Petroleum distillate	= Distillates: straight run
Petroleum insulating oil	= Oils, miscellaneous: transformer
Petroleum jelly	= Petrolatum
Petroleum naphtha	= Petroleum naphtha
Petroleum pitch	= Asphalt blending stocks: straight run residue
Petroleum residue	= Asphalt blending stocks: straight run residue
Petroleum solvent	= Naphtha: solvent
Petroleum solvent	= Naphtha: stoddard solvent
Petroleum solvent	= Naphtha: VM & P
Petroleum solvent	= Petroleum naphtha
Petroleum spirits	= Mineral spirits
Petroleum tailings	= Asphalt blending stocks: roofers flux
Petroleum wax	= Waxes: paraffin
Petroleum	= Oils: crude
Phellandrene	= Dipentene
Phenachlor	= Trichlorophenol
Phenacyl chloride	= Chloroacetophenone
Phenador-X	= Diphenyl
Phenic acid	= Phenol
Phenol, 2,4,6-trinitro-, ammonium salt	= Ammonium picrate, wet
Phenol, o-chloro-	= o-Chlorophenol
Phenol, o-ethyl	= Ethylphenol
Phenol, pentachloro-, sodium salt	= Sodium pentachlorophenate
Phenol,2-chloro-	= o-Chlorophenol
Phenol	= Phenol
Phenoxybenzene	= Diphenyl ether
2-Phenoxyethanol	= Ethylene glycol phenyl ether
1-Phenyl-1-xylyl ethane	= 1-Phenyl-1-xylyl ethane
Phenyl bromide	= Bromobenzene
Phenyl cellosolve	= Ethylene glycol phenyl ether
Phenyl chloride	= Chlorobenzene
Phenyl chloromethylketone	= Chloroacetophenone
Phenyl ether	= Diphenyl ether
a-Phenyl ethyl alcohol	= a-Methylbenzyl alcohol
Phenyl fluoride	= Fluorobenzene
Phenyl hydroxide	= Phenol
Phenyl mercaptan	= Benzenethiol
Phenyl perchloryl	= Hexachlorobenzene
Phenyl xylyl ethane	= 1-Phenyl-1-xylyl ethane
Phenylamine	= Aniline
N-Phenylaniline	= Diphenylamine
Phenylarsenic dichloride	= Phenylchloroarsine
Phenylbenzene	= Diphenyl
Phenylcarbinol	= Benzyl alcohol
Phenylcyanide	= Benzonitrile
1-Phenyldecane	= n-Decylbenzene

SYNONYM	COMPOUND NAMES
Phenyldichloroarsine	= Phenyldichloroarsine
1-Phenyldodecane	= Dodecylbenzene
Phenylethane	= Ethylbenzene
1-Phenylethanol	= <i>a</i> -Methylbenzyl alcohol
1-Phenylethanone	= Acetophenone
Phenylethylene	= Styrene
Phenylhydrazine hydrochloride	= Phenylhydrazine hydrochloride
Phenylhydrazine	= Phenylhydrazine
Phenylhydrazinium chloride	= Phenylhydrazine hydrochloride
Phenylmercuric acetate	= Phenylmercuric acetate
Phenylmethanol	= Benzyl alcohol
Phenylmethyl acetate	= Benzyl acetate
Phenylmethyl alcohol	= Benzyl alcohol
Phenylmethyl amine	= Benzylamine
Phenylmethyl carbinol	= <i>a</i> -Methylbenzyl alcohol
Phenylphosphine dichloride	= Benzene phosphorus dichloride
Phenylphosphine thiodichloride	= Benzene phosphorus thiodichloride
Phenylphosphonothioic dichloride	= Benzene phosphorus thiodichloride
Phenylphosphonous dichloride	= Benzene phosphorus dichloride
Phenylphosphorus dichloride	= Benzene phosphorus dichloride
1-Phenylpropane	= <i>n</i> -Propylbenzene
Phenylpropylene	= <i>alpha</i> -Methylstyrene
1-Phenyltetradecane	= Tetradecylbenzene
Phenylthiol	= Benzenethiol
1-Phenyltridecane	= Tridecylbenzene
1-Phenylundecane	= <i>n</i> -Undecylbenzene
Phlorol	= Ethylphenol
Phosdrin	= Phosdrin
Phosfene	= Phosdrin
Phosgene	= Phosgene
Phosphinic acid, ammonium salt	= Ammonium hypophosphite
Phosphonic acid, dimethyl ester	= Dimethyl hydrogen phosphite
Phosphoric acid triethyleneimide	= Tris(Aziridinyl)phosphine oxide
Phosphoric acid, tri-butyl ester	= Tributyl phosphate
Phosphoric acid, triethyl ester	= Triethyl phosphate
Phosphoric acid, tris(2-methylphenyl) ester	= Tricresyl phosphate ( $\geq$ 1% <i>ortho</i> isomer)
Phosphoric acid	= Phosphoric acid
Phosphoric sulfide	= Phosphorus pentasulfide
Phosphorodichloridic acid, ethyl ester	= Ethyl phosphorodichloridate
Phosphorothioic acid, O,O-diethyl-O-p-Nitrophenyl ester	= Parathion
Phosphorous acid, triethyl ester	= Triethyl phosphite
Phosphorous acid	= Trimethyl phosphite
Phosphorus bromide	= Phosphorus tribromide
Phosphorus oxychloride	= Phosphorus oxychloride
Phosphorus pentasulfide	= Phosphorus pentasulfide
Phosphorus persulfide	= Phosphorus pentasulfide
Phosphorus tribromide	= Phosphorus tribromide
Phosphorus trichloride	= Phosphorus trichloride
Phosphorus, black	= Phosphorus, black
Phosphorus, red	= Phosphorus, red
Phosphorus, white	= Phosphorus, white
Phosphoryl chloride	= Phosphorus oxychloride

SYNONYM	COMPOUND NAMES
Photophor	= Calcium phosphide
PHPH	= Diphenyl
Phthalandione	= Phthalic anhydride
Phthalic acid anhydride	= Phthalic anhydride
Phthalic acid, benzyl butyl ether	= Butyl benzyl phthalate
Phthalic acid, bis-(2-ethylhexyl ester)	= Di-(2-ethylhexyl)phthalate
Phthalic acid, bis-(7-methyloctyl) ester	= Diisononyl phthalate
Phthalic acid, bis (2-ethylhexyl ester)	= Dioctyl phthalate
Phthalic acid, bis (8-methyl-nonyl) ester	= Diisodecyl phthalate
Phthalic acid, di-isobutyl ester	= Diisobutyl phthalate
Phthalic acid, diamyl ester	= Amyl phthalate
Phthalic acid, diamyl ester	= Di-n-amyl phthalate
Phthalic acid, dibutyl ester	= Dibutyl phthalate
Phthalic acid, diethyl ester	= Diethyl phthalate
Phthalic acid, diheptyl ester	= Diheptyl phthalate
Phthalic acid, diisodecyl ester	= Diisodecyl phthalate
Phthalic acid, dinonyl ester	= Dinonyl phthalate
Phthalic acid, dipentyl ester	= Amyl phthalate
Phthalic acid, dipentyl ester	= Di-n-amyl phthalate
Phthalic acid, ditridecyl ester	= Ditridecyl phthalate
Phthalic acid, diundecyl ester	= Diundecyl phthalate
m-Phthalic acid	= Isophthalic acid
Phthalic anhydride	= Phthalic anhydride
Phygon-XL	= Dichlone
Phygon	= Dichlone
Phytar	= Sodium cacodylate
Picfume	= Chloropicrin
Picoline	= 2-Methylpyridine
2-Picoline	= 2-Methylpyridine
alpha-Picoline	= 2-Methylpyridine
3-Picoline	= 3-Methylpyridine
m-Picoline	= 3-Methylpyridine
b-Picoline	= 3-Methylpyridine
gamma-Picoline	= 4-Methylpyridine
p-Picoline	= 4-Methylpyridine
4-Picoline	= 4-Methylpyridine
Pigment white 3	= Lead sulfate
Pimelic ketone	= Cyclohexanone
alpha-Pinene	= Pinene
2-Pinene	= Pinene
Pinene	= Pinene
Piperazidine	= Piperazine
1-Piperazine ethanamine	= N-Aminoethyl piperazine
Piperazine	= Piperazine
Piperylene	= 1,3-Pentadiene
Pivalic acid	= Trimethylacetic acid
Planavin	= Nitralin
Plant spray oil	= Oils, miscellaneous: spray
Plastic latex	= Latex, liquid synthetic
Plasticized DDP	= Diisodecyl phthalate
Plumbous arsenate	= Lead arsenate
Plumbous chloride	= Lead chloride
Plumbous fluoride	= Lead fluoride
Plumbous oxide	= Litharge

SYNONYM	COMPOUND NAMES
Plumbous sulfide	= Lead sulfide
Pluracol polyol	= Polypropylene glycol
PNA	= 4-Nitroaniline
PNP	= 4-Nitrophenol
Poly-solv DB	= Diethylene glycol monobutyl ether
Poly-solv DE	= Diethylene glycol monoethyl ether
Poly-solv DM,	= Diethylene glycol monomethyl ether
Poly-solv EB	= Ethylene glycol monobutyl ether
Poly-solv EE acetate	= 2-Ethoxyethyl acetate
Poly-solv EE acetate	= Ethylene glycol monoethyl ether acetate
Poly-solv EE	= 2-Ethoxyethanol
Poly-solv EE	= Ethylene glycol monoethyl ether
Poly-solv EM	= Ethylene glycol monomethyl ether
Poly (oxyethyl) dodecyl ether	= Ethoxylated dodecanol
Poly (oxyethyl) lauryl ether	= Ethoxylated dodecanol
Poly (propylene glycol) methyl ether	= Polypropylene glycol methyl ether
Poly solv	= Diethylene glycol dimethyl ether
Poly(dimethylsiloxane)	= Dimethylpolysiloxane
Poly(ethyleneimine)	= Polyethylene polyamines
Poly(oxyethyl) myristyl ether	= Ethoxylated tetradecanol
Poly(oxyethyl) pentadecyl ether	= Ethoxylated pentadecanol
Poly(oxyethyl) tetradecyl ether	= Ethoxylated tetradecanol
Poly(oxyethyl) tridecyl ether	= Ethoxylated tridecanol
Polybutene	= Polybutene
Polychlorinated biphenyl	= Polychlorinated biphenyl
Polychloropolyphenyls	= Polychlorinated biphenyl
Polycizer 962-BPA	= Ditridecyl phthalate
Polyethylene polyamines	= Polyethylene polyamines
Polyethyleneimine	= Polyethylene polyamines
Polyformaldehyde	= Paraformaldehyde
Polyisobutylene plastics	= Polybutene
Polyisobutylene resins	= Polybutene
Polyisobutylene waxes	= Polybutene
Polymethylene polyphenyl isocyanate	= Polymethylene polyphenyl isocyanate
Polyoxpropylene glycol	= Polypropylene glycol
Polyoxymethylene glycol	= Paraformaldehyde
Polyoxymethylene	= Paraformaldehyde
Polyoxypropylene glycol methyl ether	= Polypropylene glycol methyl ether
Polyoxypropylene glycol	= Polypropylene glycol
Polyphosphoric acid	= Polyphosphoric acid
Polypropylene glycol methyl ether	= Polypropylene glycol methyl ether
Polypropylene glycol	= Polypropylene glycol
Polypropylene glycols P400 to P4000	= Polypropylene glycol
Polypropylene	= Polypropylene
Potash nitrate	= Potassium nitrate
Potash soap	= Potassium oleate
Potassium acid arsenate	= Potassium arsenate
Potassium acid oxalate	= Potassium binoxalate
Potassium antimonyl tartrate	= Antimony potassium tartrate
Potassium arsenate	= Potassium arsenate
Potassium arsenite	= Potassium arsenite
Potassium bichromate	= Potassium dichromate
Potassium binoxalate	= Potassium binoxalate
Potassium chlorate	= Potassium chlorate

SYNONYM	COMPOUND NAMES
Potassium chromate (VI)	= Potassium chromate
Potassium chromate	= Potassium chromate
Potassium cyanide	= Potassium cyanide
Potassium dichloro-s-triazinetriene	= Potassium dichloro-s-triazinetriene
Potassium dichloroisocyanurate	= Potassium dichloro-s-triazinetriene
Potassium dichromate	= Potassium dichromate
Potassium dihydrogen arsenate	= Potassium arsenate
Potassium fluozirconate	= Zirconium potassium flouride
Potassium hexafluorozirconate	= Zirconium potassium flouride
Potassium hydroxide solution	= Caustic potash solution
Potassium hydroxide	= Potassium hydroxide
Potassium iodide	= Potassium iodide
Potassium metaarsenite	= Potassium arsenite
Potassium nitrate	= Potassium nitrate
Potassium oleate	= Oleic acid, potassium salt
Potassium oleate	= Potassium oleate
Potassium oxalate monohydrate	= Potassium oxalate
Potassium oxalate	= Potassium oxalate
Potassium permanganate	= Potassium permanganate
Potassium peroxide	= Potassium peroxide
Potassium superoxide	= Potassium peroxide
Potassium zinc chromate	= Zinc potassium chromate
Potassium zirconium fluoride	= Zirconium potassium flouride
Potassium	= Potassium
Potato spirit oil	= Isoamyl alcohol
Potcrate	= Potassium chlorate
Preservative oil	= Oils, miscellaneous: penetrating
Primagram	= Metolachlor
Prime steam lard	= Oils, edible: lard
Primextra	= Metolachlor
Prodox 131	= o-Isopropyl phenol
Propadiene-methylacetylene mixture	= Methyl acetylene, propadiene mixture
Propanal	= Propionaldehyde
1-Propanamine, 2-methyl-N-(2-methyl propyl)-	= Diisobutylamine
Propane-1-thiol	= n-Propyl mercaptan
Propane-2-carboxylic acid	= Isobutyric acid
Propane-2-thiol	= Isopropyl mercaptan
Propane-butane-(propylene)	= Liquefied petroleum gas
Propane, 1-nitro-	= 1-Nitropropane
Propane, 1,2,3-trichloro	= 1,2,3-Trichloropropane
Propane, chloro-	= n-Propyl chloride
Propane, 1,1-dichloro-	= 1,1-Dichloropropane
Propane	= Propane
Propanecarboxylic acid	= n-Butyric acid
Propanedinitrile	= Propanedinitrile
1,2-Propanediol-1-acrylate	= Hydroxypropyl acrylate
1,2-Propanediol 1-methacrylate	= Hydroxypropyl methacrylate
1,3-Propanediol, 2,2-dimethyl	= 2,2-Dimethylpropane-1,3-diol
1,2-Propanediol	= Propylene glycol
Propanenitrile, 2-hydroxy-2-methyl	= Acetone cyanohydrin
Propanenitrile	= Propionitrile
2-Propanethiol	= Isopropyl mercaptan
1-Propanethiol	= n-Propyl mercaptan

SYNONYM	COMPOUND NAMES
1,2,3-Propanetriol	= Glycerine
Propanoic acid butyl ester	= n-Butyl propionate
Propanoic acid, 2-chloro-	= 2-Chloropropionic acid
Propanoic acid, 2,2-di-methyl-	= Trimethylacetic acid
Propanoic acid, ethyl ester	= Ethyl propionate
Propanoic acid	= Propionic acid
Propanoic anhydride	= Propionic anhydride
2-Propanol 1,1',1"-nitrilotri-	= Triisopropanolamine
1-Propanol, 2-amino-	= 2-Propanolamine
1-Propanol, 2-amino-2-methyl-	= 2-Amino-2-methyl-1-propanol (90% or less)
Propanol, 3-(3-(3-methoxypropoxy)propoxy)-	= Tripropylene glycol methyl ether
1-Propanol, 3-amino	= n-Propanolamine
2-Propanol	= Isopropyl alcohol
1-Propanol	= n-Propyl alcohol
2-Propanolamine	= 2-Propanolamine
n-Propanolamine	= n-Propanolamine
3-Propanolamine	= n-Propanolamine
Propanolide	= beta-Propiolactone
2-Propanone	= Acetone
Propanone	= Acetone
Propargil	= Propargite
Propargite	= Propargite
Propargyl alcohol	= Propargyl alcohol
2-Propen-1-ol	= Allyl alcohol
2-Propenal	= Acrolein
Propenamide (50%)	= Acrylamide solution
Propene polymer	= Polypropylene
1-Propene, 2-methyl trimer	= Triisobutylene
Propene, trimer	= Propylene trimer
Propene	= Propylene
2-Propenenitrile, 2-methyl	= Methacrylonitrile
Propeneoxide	= Propylene oxide
Propenionic acid, 2-Methylene	= Methacrylic acid
2-Propenoic acid, decyl ester	= n-Decyl acrylate
Propenoic acid	= Acrylic acid
beta-Propiolactone	= beta-Propiolactone
Propiolic alcohol	= Propargyl alcohol
Propionaldehyde	= Propionaldehyde
Propione	= Diethyl ketone
Propionic acid butyl ester	= n-Butyl propionate
Propionic acid, 2-chloro-	= 2-Chloropropionic acid
Propionic acid, 3-chloro-	= 3-Chloropropionic acid
Propionic acid, 3-ethoxyethyl ester	= Ethyl-3-ethoxypropionate
Propionic acid	= Propionic acid
Propionic aldehyde	= Propionaldehyde
Propionic anhydride	= Propionic anhydride
Propionic nitrile	= Propionitrile
Propionitrile	= Propionitrile
beta-Propionolactone	= beta-Propiolactone
Propionyl oxide	= Propionic anhydride
n-Propoxypropanol	= n-Propoxypropanol
N-Propyl-1-propanamine	= Di-n-propylamine



SYNONYM	COMPOUND NAMES
2-Propyl acetate	= Isopropyl acetate
n-Propyl acetate	= n-Propyl acetate
sec-Propyl alcohol	= Isopropyl alcohol
n-Propyl alcohol	= n-Propyl alcohol
Propyl alcohol	= n-Propyl alcohol
Propyl aldehyde	= Propionaldehyde
n-Propyl chloride	= n-Propyl chloride
Propyl cyanide	= Butyronitrile
n-Propyl ether	= n-Propyl ether
n-Propyl mercaptan	= n-Propyl mercaptan
n-Propyl nitrate	= n-Propyl nitrate
iso-Propylamine	= Isopropylamine
1-Propylamine	= n-Propylamine
n-Propylamine	= n-Propylamine
n-Propylbenzene	= n-Propylbenzene
Propylbromide	= 1-Bromopropane
n-Propylbromide	= 1-Bromopropane
n-Propylcarbinol	= n-Butyl alcohol
n-Propylcarbonyl chloride	= Butyl chloride
Propylene butylene polymer	= Propylene butylene polymer
Propylene dichloride	= 1,2-Dichloropropane
Propylene glycol ethyl ether	= Propylene glycol ethyl ether
Propylene glycol methyl ether acetate	= Propylene glycol methyl ether acetate
Propylene glycol methyl ether	= Propylene glycol methyl ether
Propylene glycol monoacrylate	= Hydroxypropyl acrylate
Propylene glycol monomethacrylate	= Hydroxypropyl methacrylate
Propylene glycol	= Propylene glycol
Propylene oxide	= Propylene oxide
Propylene tetramer	= Dodecene
Propylene tetramer	= Propylene tetramer
Propylene trimer	= Nonene
Propylene trimer	= Propylene trimer
Propylene	= Propylene
Propyleneimine	= Propyleneimine
Propylethylene	= 1-Pentene
Propylic aldehyde	= Propionaldehyde
Propylidene chloride	= 1,1-Dichloropropane
2-Propyn-1-ol	= Propargyl alcohol
1-Propyne-3-ol	= Propargyl alcohol
Propynyl alcohol	= Propargyl alcohol
Prussic acid	= Hydrogen cyanide
Pseudocumene	= 1,2,4-Trimethylbenzene
Pseudocumol	= 1,2,4-Trimethylbenzene
Pseudoheptyl alcohol	= Ethyl butanol
Pseudothiourea	= Thiocarbamide
Psicumene	= 1,2,4-Trimethylbenzene
Pyranol 1478	= 1,2,3-Trichlorobenzene
Pyrazine hexahydride	= Piperazine
Pyrethrins	= Pyrethrins
Pyrethrum flowers	= Pyrethrins
4-Pyridinamine	= 4-Aminopyridine
Pyridine, 3-methyl	= 3-Methylpyridine
Pyridine	= Pyridine
4-Pyridylamine	= 4-Aminopyridine

SYNONYM	COMPOUND NAMES
Pyrocatechin	= Catechol
Pyrocatechinic acid	= Catechol
Pyrofax	= Liquefied petroleum gas
Pyrogallic acid	= Pyrogallic acid
Pyrogallol	= Pyrogallic acid
Pyrogenetic acid	= Hydroquinone
Pyromucic aldehyde	= Furfural
Pyroxylic spirit	= Methyl alcohol
Pyroxylin solution	= Collodion
Quakeral	= Furfural
Quicklime	= Calcium oxide
Quicksilver	= Mercury
Quinol	= Hydroquinone
Quinoline	= Quinoline
Quinone	= p-Benzoquinone
R-124	= Monochlorotetrafluoroethane
R-21	= Dichloromonofluoromethane
Racemic lactic acid	= Lactic acid
Range oil	= Jet fuels: JP-1
Range oil	= Kerosene
Range oil	= Oils, fuel: no. 1
Raspite	= Lead tungstate
Ratox	= Thallium sulfate
Raw linseed oil	= Oils, miscellaneous: linseed
RC plasticizer DBP	= Dibutyl phthalate
RCRA waste number U152	= Methacrylonitrile
Realgar	= Arsenic disulfide
Red arsenic glass	= Arsenic disulfide
Red arsenic sulfide	= Arsenic disulfide
Red oil	= Oleic acid
Red orpiment	= Arsenic disulfide
Red oxide of nitrogen	= Nitrogen tetroxide
Red TR base	= 4-Chloro-o-toluidine
Refrigerant 114	= Dichlorotetrafluoroethane
Refrigerant 152A	= 1,1-Difluoroethane
Refrigerant 21	= Dichloromonofluoromethane
Regalon	= Diquat
Reglone	= Diquat
Regulox	= Maleic hydrazide
Reofos 95	= Trixylenyl phosphate
Residual asphalt	= Asphalt blending stocks: straight run residue
Residual fuel oil	= Oils, fuel: 4
Residual fuel oil	= Oils, fuel: 5
Residual fuel oil	= Oils, fuel: no. 6
Residual oil	= Asphalt blending stocks: roofers flux
Resin oil	= Oils, miscellaneous: rosin
Resorcin	= Resorcinol
Resorcinol	= Resorcinol
Retarder W	= Salicylic acid
Retinol	= Oils, miscellaneous: resin
Retinol	= Oils, miscellaneous: rosin
Rhodanate	= Sodium thiocyanate
Rhodanate	= Sodium thiocyanate solution (56% or

SYNONYM	COMPOUND NAMES
Road binder	= Asphalt blending stocks: straight run residue
Road oil	= Asphalt blending stocks: roofers flux
Rose ether	= Ethylene glycol phenyl ether
Rosin oil	= Oils, miscellaneous: resin
Rosinol	= Oils, miscellaneous: resin
Rosinol	= Oils, miscellaneous: rosin
Rubbing alcohol	= Isopropyl alcohol
Ruby arsenic	= Arsenic disulfide
Saccharose	= Sucrose
Saccharum	= Sucrose
Safflower oil	= Oils, edible: safflower
Safflower seed oil	= Oils, edible: safflower
Sal acetosella	= Potassium binoxalate
Sal ammoniac	= Ammonium chloride
Sal volatile	= Ammonium carbonate
Salicylal	= Salicylaldehyde
Salicylaldehyde	= Salicylaldehyde
Salicylic acid	= Salicylic acid
Salicylic aldehyde	= Salicylaldehyde
Salmiac	= Ammonium chloride
Salt of Saturn	= Lead acetate
Salt of sorrel	= Potassium binoxalate
Saltpeter	= Potassium nitrate
Salufer	= Sodium silicofluoride
Sand acid	= Fluosilicic acid
Santicizer 711	= Diundecyl phthalate
Santochlor	= p-Dichlorobenzene
Santophen 20	= Pentachlorophenol
Saralex	= Diazinon
Scheele's green	= Copper arsenite
Scheelite	= Lead tungstate
Schweinfurth green	= Copper acetoarsenite
SDMH	= 1,2-Dimethylhydrazine
Seal-coating material	= Asphalt blending stocks: straight run residue
Secondary ammonium phosphate	= Ammonium phosphate
Selenic anhydride	= Selenium trioxide
Selenious acid, disodium salt	= Sodium selenite
Selenious anhydride	= Selenium dioxide
Selenium dioxide	= Selenium dioxide
Selenium oxide	= Selenium dioxide
Selenium trioxide	= Selenium trioxide
Senarmontite	= Antimony trioxide
Sentry	= Calcium hypochlorite
Sevin	= Carbaryl
Sextone B	= Methylcyclohexane
Sextone	= Cyclohexanone
Shell charcoal	= Charcoal
Signal oil	= Oils, miscellaneous: mineral seal
Silibond	= Ethyl silicate
Silicochloroform	= Trichlorosilane
Silicofluoric acid	= Fluosilicic acid

SYNONYM	COMPOUND NAMES
Silicon chloride	= Silicon tetrachloride
Silicon tetrachloride	= Silicon tetrachloride
Silicone fluids	= Dimethylpolysiloxane
Silver acetate	= Silver acetate
Silver carbonate	= Silver carbonate
Silver fluoride	= Silver fluoride
Silver iodate	= Silver iodate
Silver monofluoride	= Silver fluoride
Silver nitrate	= Silver nitrate
Silver oxide	= Silver oxide
Silver sulfate	= Silver sulfate
Silvex, isooctyl ester	= Isooctyl ester
Silvex	= 2-(2,4,5-Trichlorophenoxy) propanoic acid
Silvisar 510	= Cacodylic acid
SKDN	= White spirit (low (15-20%) aromatic)
Slaked lime	= Calcium hydroxide
Slow curing asphalt	= Oils, miscellaneous: road
Smithsonite	= Zinc carbonate
Soap	= Ammonium stearate
Soda chloric acid, sodium salt	= Sodium chlorate solution
Soda niter	= Sodium nitrate
Sodamide	= Sodium amide
Sodium 2-benzothiazolethioate	= Sodium 2-mercaptobenzothiazol solution
Sodium 2-mercaptobenzothiazol solution	= Sodium 2-mercaptobenzothiazol solution
Sodium acid pyrophosphate	= Sodium phosphate
Sodium acid sulfite	= Sodium bisulfite
Sodium alkyl sulfates	= Sodium alkyl sulfates
Sodium alkylbenzenesulfonates	= Sodium alkylbenzenesulfonates
Sodium aluminate solution (45% or less)	= Sodium aluminate solution (45% or less)
Sodium amide	= Sodium amide
Sodium arsenate, dibasic	= Sodium arsenate
Sodium arsenate	= Sodium arsenate
Sodium arsenite	= Sodium arsenite
Sodium azide	= Sodium azide
Sodium baborate	= Sodium borate
Sodium bichromate	= Sodium dichromate
Sodium bifluoride	= Sodium bifluoride
Sodium bisulfide	= Sodium hydrosulfide solution
Sodium bisulfite solution	= Sodium hydrogen sulfite solution (35% or less)
Sodium bisulfite	= Sodium bisulfite
Sodium borate	= Sodium borate
Sodium borohydride	= Sodium borohydride
Sodium cacodylate	= Sodium cacodylate
Sodium cetyl sulfate solution	= Hexadecyl sulfate, sodium salt
Sodium chlorate solution	= Sodium chlorate solution
Sodium chlorate	= Sodium chlorate
Sodium chromate (VI)	= Sodium chromate
Sodium chromate	= Sodium chromate
Sodium cyanide	= Sodium cyanide
Sodium dichloro-s-triazinetriene	= Sodium dichloro-s-triazinetriene
Sodium dichloroisocyanurate	= Sodium dichloro-s-triazinetriene
Sodium dichromate	= Sodium dichromate

SYNONYM	COMPOUND NAMES
Sodium difluoride	= Sodium bifluoride
Sodium dimethylarsenate	= Sodium cacodylate
Sodium dodecyl sulfate	= Dodecyl sulfate, sodium salt
Sodium dodecylbenzene sulfonate	= Dodecyl benzene sulfonic acid, sodium salt
Sodium ferrocyanide	= Sodium ferrocyanide
Sodium fluoride	= Sodium fluoride
Sodium fluoroacetate	= Sodium fluoroacetate
Sodium fluosilicate	= Sodium silicofluoride
Sodium hexafluorosilicate	= Sodium silicofluoride
Sodium hydride	= Sodium hydride
Sodium hydrogen alkyl sulfate	= Sodium alkyl sulfates
Sodium hydrogen difluoride	= Sodium bifluoride
Sodium hydrogen fluoride	= Sodium bifluoride
Sodium hydrogen sulfide	= Sodium hydrosulfide solution
Sodium hydrogen sulfite solution (35% or less)	= Sodium hydrogen sulfite solution (35% or less)
Sodium hydrosulfide solution	= Sodium hydrosulfide solution
Sodium hydroxide solution	= Caustic soda solution
Sodium hydroxide solution	= Sodium hydroxide solution
Sodium hydroxide	= Sodium hydroxide
Sodium hypochlorite solution	= Sodium hypochlorite solution
Sodium hypochlorite	= Sodium hypochlorite
Sodium lauryl sulfate	= Dodecyl sulfate, sodium salt
Sodium meta arsenite	= Sodium arsenite
Sodium metabisulfite	= Sodium bisulfite
Sodium methoxide	= Sodium methylate
Sodium methylate	= Sodium methylate
Sodium monofluoroacetate	= Sodium fluoroacetate
Sodium nitrate	= Sodium nitrate
Sodium nitrite liquor	= Sodium nitrite solution
Sodium nitrite solution	= Sodium nitrite solution
Sodium nitrite	= Sodium nitrite
Sodium oleate	= Oleic acid, sodium salt
Sodium ortho arsenite	= Sodium arsenite
Sodium oxalate	= Sodium oxalate
Sodium pentachlorophenate	= Sodium pentachlorophenate
Sodium phosphate dibasic	= Sodium phosphate
Sodium phosphate, monobasic	= Sodium phosphate
Sodium phosphate, tribasic	= Sodium phosphate
Sodium phosphate, tribasic	= Sodium phosphate, tribasic
Sodium phosphate	= Sodium phosphate
Sodium pyroborate	= Sodium borate
Sodium pyrosulfite	= Sodium bisulfite
Sodium rhodanide	= Sodium thiocyanate
Sodium rhodanide	= Sodium thiocyanate solution (56% or less)
Sodium selenite	= Sodium selenite
Sodium silicate	= Sodium silicate
Sodium silicofluoride	= Sodium silicofluoride
Sodium sulfhydrate	= Sodium hydrosulfide solution
Sodium sulfide	= Sodium sulfide
Sodium sulfite	= Sodium sulfite
Sodium sulfocyanate	= Sodium thiocyanate

SYNONYM	COMPOUND NAMES
Sodium sulfocyanate	= Sodium thiocyanate solution (56% or less)
Sodium tetraborate, anhydrous	= Sodium borate
Sodium thiocyanate solution (56% or less)	= Sodium thiocyanate solution (56% or less)
Sodium thiocyanate	= Sodium thiocyanate
Sodium	= Sodium
Solar nitrogen solutions	= Ammonium nitrate-urea solution
Soluble glass	= Sodium silicate
Solvarone	= Dimethyl phthalate
Sorbit	= Sorbitol
Sorbitol	= Sorbitol
Sorbol	= Sorbitol
Soybean oil	= Oils, edible: soya bean
Spectracide	= Diazinon
Spirit of ether nitrite	= Ethyl nitrite
Spirit of turpentine	= Turpentine
Spotting naphtha	= Naphtha: stoddard solvent
Staflax DTD	= Ditridecyl phthalate
Stannous flouride	= Stannous flouride
Steam turbine lube oil	= Oils, miscellaneous: turbine
Steam turbine oil	= Oils, miscellaneous: turbine
Stearic acid, ammonium salt	= Ammonium stearate
Stearic acid, lead salt	= Lead stearate
Stearic acid	= Stearic acid
Stearophanic acid	= Stearic acid
Stearyl alcohol, crude	= Tallow fatty alcohol
Stearyldimethylbenzylammonium chloride	= Benzyltrimethyloctadecylammonium chloride
Steinbuhl yellow	= Calcium chromate
Stolzite	= Lead tungstate
Straight run gasoline	= Distillates: straight run
Strontium chromate	= Strontium chromate
Strontium nitrate	= Strontium nitrate
Strontium yellow	= Strontium chromate
Strychnine	= Strychnine
Styralyl alcohol	= a-Methylbenzyl alcohol
Styrene	= Styrene
Styrol	= Styrene
Styrolene	= Styrene
Sucrose	= Sucrose
Sugar of lead	= Lead acetate
Sugar	= Sucrose
Sulfamic acid, cobalt salt	= Cobalt sulfamate
Sulfamic acid, monoammonium salt	= Ammonium sulfamate
Sulfate of copper	= Copper sulfate
Sulfate turpentine	= Turpentine
Sulfated neatsfoot oil	= Oils, miscellaneous: tanner's
Sulfolane-W	= Sulfolane
Sulfolane	= Sulfolane
Sulfonated alkylbenzene, sodium salt	= Sodium alkylbenzenesulfonates
Sulfotep	= Tetraethyl dithiopyrophosphate
Sulfur dioxide	= Sulfur dioxide
Sulfur monochloride	= Sulfur monochloride

SYNONYM	COMPOUND NAMES
Sulfur	= Sulfur
Sulfuretted hydrogen	= Hydrogen sulfide
Sulfuric acid, chromium (3#I+) salt (3-2)	= Chromic sulfate
Sulfuric acid, diethyl ester	= Diethyl sulfate
Sulfuric acid, spent	= Sulfuric acid, spent
Sulfuric acid, thallium salt	= Thallium sulfate
Sulfuric acid	= Sulfuric acid
Sulfuric chlorhydrin	= Chlorosulfonic acid
Sulfuryl chloride	= Sulfuryl chloride
Sulourea	= Thiocarbamide
Sulphuretted hydrogen	= Hydrogen sulfide
Superoxol	= Hydrogen peroxide
Swedish green	= Copper arsenite
Sweet birch oil	= Methyl salicylate
Sweet spirit of nitre	= Ethyl nitrite
Synthetic rubber latex	= Latex, liquid synthetic
Systox and isosystox mixture	= Demeton
2,4,5-T esters	= 2,4,5-T esters
2,4,5-T sodium salt	= 2,4,5-Trichlorophenoxyacetic acid, sodium salt
T.E.P.	= Tetraethyl pyrophosphate
T.E.P.P.	= Tetraethyl pyrophosphate
2,4,5-T	= 2,4,5-Trichlorophenoxyacetic acid
Tall oil fatty oil	= Tall oil, fatty acid
Tall oil, fatty acid	= Tall oil, fatty acid
Tallow benzyl dimethyl ammonium chloride	= Benzyldimethyloctadecylammonium chloride
Tallow fatty alcohol	= Tallow fatty alcohol
Tallow oil	= Tallow
Tallow	= Tallow
Tannic acid	= Tannic acid
Tannin	= Tannic acid
Tar acids	= Cresols
Tar camphor	= Naphthalene
Tartar emetic	= Antimony potassium tartrate
1-Tartaric acid, ammonium salt	= Ammonium tartrate
Tartaric acid, copper salt	= Copper tartrate
Tartarized antimony	= Antimony potassium tartrate
Tartrated antimony	= Antimony potassium tartrate
TBA	= tert-Butylamine
TBP	= Tributyl phosphate
TBT	= Butyl toluene
TCP	= Tricresyl phosphate (<1% ortho isomer)
TDE	= DDD
TDI	= Toluene 2,4-diisocyanate
TEA	= Triethylaluminum
Teaberry or wintergreen oil	= Methyl salicylate
Tear gas	= Chloroacetophenone
Teflon monomer	= Tetrafluoroethylene
TEG	= Triethylene glycol
TEL	= Tetraethyl lead
Telone	= 1,3-Dichloropropene
Telone	= Dichloropropene, dichloropropane mixture

SYNONYM	COMPOUND NAMES
TEN	= Triethylamine
TEP	= Triethyl phosphate
Terephthalic acid, dimethyl ester	= Dimethyl terephthalate
Tergitol nonionic 3-A-6	= Ethoxylated tridecanol
Tergitol nonionic 45-S-10	= Ethoxylated pentadecanol
Tergitol nonionic 45-S-10	= Ethoxylated tetradecanol
Tergitol nonionic TMN	= Ethoxylated dodecanol
Terpinene	= Dipentene
delta-1,8-Terpodiene	= Dipentene
TETA	= Triethylenetetramine
Tetan	= Tetranitromethane
Tetraammine copper sulfate	= Copper sulfate, ammoniated
3,6,9,12-Tetraazatetradecane-1,14-diamine	= Pentaethylenehexamine
Tetrabutyl titanate	= Tetrabutyl titanate
Tetracap	= Tetrachloroethylene
Tetrachloroethane	= Tetrachloroethane
1,1,2,2-Tetrachloroethane	= Tetrachloroethane
Tetrachloroethylene	= Tetrachloroethylene
Tetrachloromethane	= Carbon tetrachloride
Tetrachlorozirconium	= Zirconium tetrachloride
Tetradecanol	= Linear alcohols
1-Tetradecanol	= Tetradecanol
Tetradecanol	= Tetradecanol
1-Tetradecene	= 1-Tetradecene
n-Tetradecyl alcohol	= Tetradecanol
Tetradecylbenzene	= Tetradecylbenzene
Tetraethyl dithionopyrophosphate	= Tetraethyl dithiopyrophosphate
Tetraethyl dithiopyrophosphate	= Tetraethyl dithiopyrophosphate
Tetraethyl lead	= Tetraethyl lead
Tetraethyl orthosilicate	= Ethyl silicate
Tetraethyl pyrophosphate	= Tetraethyl pyrophosphate
Tetraethyl silicate	= Ethyl silicate
Tetraethylene glycol	= Tetraethylene glycol
Tetraethylenepentamine	= Tetraethylenepentamine
Tetrafluoroethylene	= Tetrafluoroethylene
Tetrahydro-2h-1, 4-oxazine	= Morpholine
3a,4,7,7a-Tetrahydro-4,7-Methanoindene	= Dicyclopentadiene
Tetrahydro-p-oxazine	= Morpholine
3a,4,7,7a-Tetrahydrodimethyl-4,7-methanoindene	= Methylcyclopentadiene dimer
Tetrahydrofuran	= Tetrahydrofuran
Tetrahydronaphthalene	= Tetrahydronaphthalene
1,2,3,4-Tetrahydronaphthalene	= Tetrahydronaphthalene
Tetrahydrothiophene-1,1-Dioxide	= Sulfolane
Tetrahydroxymethylmethane	= Pentaerythritol
Tetralin	= Tetrahydronaphthalene
Tetramethyl lead	= Tetramethyl lead
Tetramethyl thiuram disulfide	= Thiram
1,2,3,5-Tetramethylbenzene	= 1,2,3,5-Tetramethylbenzene
Tetramethylene glycol	= 1,4-Butanediol
Tetramethylene oxide	= Tetrahydrofuran
Tetramethylene sulfone	= Sulfolane
Tetramp	= Tetrahydronaphthalene



SYNONYM	COMPOUND NAMES
Tetranap	= Tetrahydronaphthalene
Tetranitromethane	= Tetranitromethane
Tetrapropylene	= Dodecene
Tetrapropylene	= Propylene tetramer
Tetrine acid	= Ethylenediamine tetracetic acid
Tetrole	= Furan
Tetron	= Tetraethyl pyrophosphate
Tetrosin LY	= Diphenyl
Texanol	= 1-Isobutyrate
Thallium (I) acetate	= Thallium acetate
Thallium (I) nitrate	= Thallium nitrate
Thallium acetate	= Thallium acetate
Thallium carbonate	= Thallium carbonate
Thallium monoacetate	= Thallium acetate
Thallium mononitrate	= Thallium nitrate
Thallium nitrate	= Thallium nitrate
Thallium sulfate	= Thallium sulfate
Thalious acetate	= Thallium acetate
Thalious carbonate	= Thallium carbonate
Thalious nitrate	= Thallium nitrate
Thalious sulfate	= Thallium sulfate
Thanol PPG	= Polypropylene glycol
THF	= Tetrahydrofuran
2-Thiapropene	= Dimethyl sulfide
Thiobutyl alcohol	= n-Butyl mercaptan
Thiocarbamide	= Thiocarbamide
Thiocarbonyl chloride	= Thiophosgene
Thiocarbonyl tetrachloride	= Perchloromethyl mercaptan
Thiocyanic acid, ammonium salt	= Ammonium thiocyanate
Thiodan	= Endosulfan
Thiodemeton	= Disulfoton
Thioethyl alcohol	= Ethyl mercaptan
Thiomethyl alcohol	= Methyl mercaptan
Thiophenol	= Benzenethiol
Thiophosgene	= Thiophosgene
Thiophosphoric anhydride	= Phosphorus pentasulfide
Thiosulfuric acid, lead salt	= Lead thiosulfate
Thiourea	= Thiocarbamide
2-Thiourea	= Thiocarbamide
Thiram	= Thiram
Thiuram	= Thiram
Thorium nitrate tetrahydrate	= Thorium nitrate
Thorium nitrate	= Thorium nitrate
TIBA	= Triisobutylaluminum
Tibal	= Triisobutylaluminum
Tin difluoride	= Stannous fluoride
Titanium butoxide	= Tetrabutyl titanate
Titanium tetrabutoxide	= Tetrabutyl titanate
Titanium tetrachloride	= Titanium tetrachloride
TMP	= Trimethyl phosphite
TNM	= Tetranitromethane
2,4-Tolamine	= Toluenediamine
Toluene 2,4-diisocyanate	= Toluene 2,4-diisocyanate
m-Toluene diamine	= Toluenediamine

SYNONYM	COMPOUND NAMES
Toluene, 2,6-dinitro-	= 2,6-Dinitrotoluene
Toluene, 3,4-dinitro-	= 3,4-Dinitrotoluene
Toluene, hexahydro	= Methylcyclohexane
Toluene, o-nitro	= o-Nitrotoluene
Toluene, p-nitro-	= p-Nitrotoluene
Toluene, p-tert-butyl	= Butyl toluene
Toluene	= Toluene
Toluenediamine	= Toluenediamine
2,4-Toluenediamine	= Toluenediamine
p-Toluenesulfonic acid	= p-Toluenesulfonic acid
m-Toluidine	= m-Toluidine
o-Toluidine	= o-Toluidine
p-Toluidine	= p-Toluidine
o-Toluol	= o-Cresol
p-Toluol	= p-Cresol
Toluol	= Toluene
meta-Toluylenediamine	= Toluenediamine
m-Tolyl chloride	= m-Chlorotoluene
o-Tolyl chloride	= o-Chlorotoluene
p-Tolyl chloride	= p-Chlorotoluene
Tolyl epoxypropyl ether	= Cresyl glycidyl ether
o-Tolyl fluoride	= 2-Fluorotoluene
m-Tolyl fluoride	= 3-Fluorotoluene
p-Tolyl fluoride	= 4-Fluorotoluene
Tolyl glycidyl ether	= Cresyl glycidyl ether
2,4-Tolylene diisocyanate	= Toluene 2,4-diisocyanate
4-m-Toluylenediamine	= Toluenediamine
o-Tolylphosphate phosphoric acid	= Tricresyl phosphate (>= 1% ortho isomer)
Tosic acid	= p-Toluenesulfonic acid
Toxaphene	= Toxaphene
Toxichlor	= Chlordane
Toxilic acid	= Maleic acid
Toxilic anhydride	= Maleic anhydride
2,4,5-TP acid esters	= Isooctyl ester
2,4,5-TP	= 2-(2,4,5-Trichlorophenoxy) propanoic acid
Transmission oil	= Oils, miscellaneous: lubricating
Transmission oil	= Oils, miscellaneous: motor
Treflan	= Trifluralin
Trethylene	= Trichloroethylene
Tri-6	= gamma-Benzene hexachloride
Tri-iso-propanolamine	= Triisopropanolamine
Tri-n-butyl phosphate	= Tributyl phosphate
Tri-n-propylamine	= Tripropylamine
Tri-o-cresyl ester	= Tricresyl phosphate (>= 1% ortho isomer)
Tri-p-cresyl phosphate	= Tricresyl phosphate (<1% ortho isomer)
Tri-p-tolyl phosphate	= Tricresyl phosphate (<1% ortho isomer)
Tributyl phosphate	= Tributyl phosphate
Tricalcium arsenate	= Calcium arsenate
Tricalcium ortho arsenate	= Calcium arsenate
Trichloran	= Trichloroethylene
Trichlorfon	= Trichlorfon

SYNONYM	COMPOUND NAMES
Trichlormethyl sulfur chloride	= Perchloromethyl mercaptan
1,1,2-Trichloro-1,2,2-trifluoroethane	= 1,1,2-Trichloro-1,2,2-trifluoroethane
1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane	= DDT
Trichloro-s-triazine-2,4,6-(1h, 3h, 5h)-trione	= Trichloro-s-triazinetriene
Trichloro-s-triazinetriene	= Trichloro-s-triazinetriene
Trichloroacetaldehyde	= Trichloroacetaldehyde
Trichloroamylsilane	= n-Amyltrichlorosilane
V-Trichlorobenzene	= 1,2,3-Trichlorobenzene
1,2,3-Trichlorobenzene	= 1,2,3-Trichlorobenzene
Vic-Trichlorobenzene	= 1,2,3-Trichlorobenzene
1,2,4-Trichlorobenzene	= 1,2,4-Trichlorobenzene
unsym-Trichlorobenzene	= 1,2,4-Trichlorobenzene
1,2,4-Trichlorobenzol	= 1,2,4-Trichlorobenzene
1,1,2-Trichloroethane	= 1,1,2-Trichloroethane
1,1,1-Trichloroethane	= Trichloroethane
Trichloroethane	= Trichloroethane
Trichloroethyl silane	= Ethyltrichlorosilane
Trichloroethyl silicone	= Ethyltrichlorosilane
Trichloroethylene	= Trichloroethylene
Trichloroethylene	= Trichloroethylene
Trichlorofluoromethane	= Trichlorofluoromethane
Trichlorohydrin	= 1,2,3-Trichloropropane
Trichloroiminoisocyanuric acid	= Trichloro-s-triazinetriene
Trichloroisocyanuric acid	= Trichloro-s-triazinetriene
Trichloromethane sulfuryl chloride	= Perchloromethyl mercaptan
Trichloromethane	= Chloroform
Trichloromethanesulfenyl chloride	= Perchloromethyl mercaptan
Trichloromethyl sulfochloride	= Perchloromethyl mercaptan
N-[(Trichloromethyl)thio]-4-cyclohexene-1,2,-dicarbodimide	= Captan
Trichloromethylsilane	= Methyltrichlorosilane
Trichloromonosilane	= Trichlorosilane
Trichloronitromethane	= Chloropicrin
Trichlorooxovanadium	= Vanadium oxytrichloride
Trichloropentylsilane	= n-Amyltrichlorosilane
2,4,5-Trichlorophenol	= Trichlorophenol
Trichlorophenol	= Trichlorophenol
2-(2,4,5-Trichlorophenoxy) propanoic acid	= 2-(2,4,5-Trichlorophenoxy) propanoic acid
2,4,5-Trichlorophenoxyacetic acid, sodium salt	= 2,4,5-Trichlorophenoxyacetic acid, sodium salt
2,4,5-Trichlorophenoxyacetic acid	= 2,4,5-Trichlorophenoxyacetic acid
1,2,3-Trichloropropane	= 1,2,3-Trichloropropane
Trichlorosilane	= Trichlorosilane
Trichlorotriazinetrione	= Trichloro-s-triazinetriene
1,1,2-Trichlorotrifluoroethane	= 1,1,2-Trichloro-1,2,2-trifluoroethane
Trichlorovinyl silicane	= Vinyltrichlorosilane
Trichlorovinylsilane	= Vinyltrichlorosilane
Triclene; algylen	= Trichloroethylene
Tricresyl phosphate (<1% ortho isomer)	= Tricresyl phosphate (<1% ortho isomer)
Tricresyl phosphate (>)	= 1% ortho isomer)=Tricresyl phosphate (>= 1% ortho isomer)

SYNONYM	COMPOUND NAMES
n-Tridecane	= Tridecane
Tridecane	= Tridecane
1-Tridecanol, phthalate	= Ditridecyl phthalate
Tridecanol	= Linear alcohols
Tridecanol	= Tridecanol
1-Tridecanol	= Tridecanol
1-Tridecene	= 1-Tridecene
Tridecylbenzene	= Tridecylbenzene
Tridimethylphenyl phosphate	= Trixylenyl phosphate
Trien	= Triethylenetetramine
Triethanolamine	= Dodecylbenzenesulfonic acid, triethanolamine salt
dodeceylbenzenesulfonate	= Dodecyl sulfate, triethanolamine salt
Triethanolamine lauryl sulfate	= Triethanolamine
Triethanolamine	= Triethyl phosphate
Triethyl phosphate	= Triethyl phosphite
Triethyl phosphite	= Triethylaluminum
Triethylaluminum	= Triethylamine
Triethylamine	= Triethylbenzene
Triethylbenzene	= Triethylbenzene
1,3,5-Triethylbenzene	= Triethylbenzene
sym-Triethylbenzene	= Triethylbenzene
Triethylene glycol di-(2-ethylbutyrate)	= Triethylene glycol di-(2-ethylbutyrate)
Triethylene glycol ethyl ether	= Triethylene glycol ethyl ether
Triethylene glycol methyl ether	= Triethylene glycol methyl ether
Triethylene glycol monoethyl ether	= Ethoxy triglycol
Triethylene glycol monoethyl ether	= Triethylene glycol ethyl ether
Triethylene glycol monomethyl ether	= Triethylene glycol methyl ether
Triethylene glycol	= Triethylene glycol
Triethylenephosphoramidate	= Tris(Aziridinyl)phosphine oxide
Triethylenetetramine	= Triethylenetetramine
Triethylolamine	= Triethanolamine
Trifluorochloroethylene	= Trifluorochloroethylene
Trifluorochloromethane	= Monochlorotrifluoromethane
Trifluoromethyl chloride	= Monochlorotrifluoromethane
Trifluoromonochloroethylene	= Trifluorochloroethylene
Trifluorovinyl chloride	= Trifluorochloroethylene
Trifluralin	= Trifluralin
Triglycine	= Nitrotriacetic acid and salts
Triglycol dicaproate	= Triethylene glycol di-(2-ethylbutyrate)
Triglycol dihexoate	= Triethylene glycol di-(2-ethylbutyrate)
Triglycol methyl ether	= Triethylene glycol methyl ether
Triglycol monoethyl ether	= Ethoxy triglycol
Triglycol monoethyl ether	= Triethylene glycol ethyl ether
Triglycol	= Triethylene glycol
1,2,3-Trihydroxybenzene	= Pyrogalllic acid
3,4,5-Trihydroxybenzoic acid	= Gallic acid
1,2,3-Trihydroxypropane	= Glycerine
Trihydroxytriethylamine	= Triethanolamine
Triisobutene	= Triisobutylene
Triisobutylaluminum	= Triisobutylaluminum
Triisobutylene	= Triisobutylene
Triisopropanolamine	= Triisopropanolamine
Trilene	= Trichloroethylene
2,4,4-Trimethyl-1-pentene	= Diisobutylene

SYNONYM	COMPOUND NAMES
2,4,6-Trimethyl-1,3,5-trioxane	= Paraldehyde
3,5,5-Trimethyl-2-cyclohexane-1-one	= Isophorone
4,7,7-Trimethyl-3-norcarene	= Carene
Trimethyl ester	= Trimethyl phosphite
Trimethyl hexamethylene diamine	= Trimethyl hexamethylene diamine
Trimethyl phosphite	= Trimethyl phosphite
Trimethylacetic acid	= Trimethylacetic acid
Trimethylamine	= Trimethylamine
Trimethylaminomethane	= tert-Butylamine
Asymmetrical Trimethylbenzene	= 1,2,4-Trimethylbenzene
1,2,4-Trimethylbenzene	= 1,2,4-Trimethylbenzene
Trimethylbenzylammonium chloride	= Benzyltrimethylammonium chloride
2,6,6-Trimethylbicyclo [3.1.1]hept-2-ene, 9cl	= Pinene
3,7,7-Trimethylbicyclo[0, 1, 4]hept-3-ene	= Carene
Trimethylcarbinol	= tert-Butyl alcohol
Trimethylchlorosilane	= Trimethylchlorosilane
Trimethylene chloride	= 1,3-Dichloropropane
Trimethylene dichloride	= 1,3-Dichloropropane
Trimethylene	= Cyclopropane
Trimethylheptanals	= Isodecaldehyde
Trimethylhexamethylene diisocyanate	= Trimethylhexamethylene diisocyanate
Trimethylsilyl chloride	= Trimethylchlorosilane
5,8,11-Trioxapentadecane	= Diethylene glycol dibutyl ether
3,6,9-Trioxaundecan-1, 11-diol	= Tetraethylene glycol
Tripropylamine	= Tripropylamine
Tripropylene glycol methyl ether	= Tripropylene glycol methyl ether
Tripropylene glycol	= Tripropylene glycol
Tripropylene	= Nonene
Tripropylene	= Propylene trimer
Trisodium nitrilotriacetate	= Nitrilotriacetic acid and salts
Trisodium orthophosphate	= Sodium phosphate, tribasic
Trisodium phosphate	= Sodium phosphate, tribasic
Trixylenyl phosphate	= Trixylenyl phosphate
Trixylyl phosphate	= Trixylenyl phosphate
p-TSA	= p-Toluenesulfonic acid
Tubercuprose	= Copper formate
Tucum oil	= Oils, edible: tucum
Turbine oil	= Oils, miscellaneous: turbine
Turpentine	= Turpentine
Turps	= Turpentine
Tyranton	= Diacetone alcohol
Ucane alkylate 12	= Dodecylbenzene
Ucar bisphenol HP	= Bisphenol A
Ucar solvent 2IM	= Dipropylene glycol methyl ether
Ucon 11	= Trichlorofluoromethane
Ucon 12	= Dichlorodifluoromethane
Uconn-22	= Chlorodifluoromethane
UDMH	= 1,1-Dimethylhydrazine
UF oxylignin	= Vanillin black liquor
UN 1272 (DOT)	= Oil, misc: pine
UN 2057 (DOT)	= Propylene trimer
UN 2243 (DOT)	= Cyclohexyl acetate
UN 2271 (DOTt)	= Ethyl amyl ketone

SYNONYM	COMPOUND NAMES
UN 2296 (DOT)	= Methylcyclohexane
UN 2323 (DOT)	= Triethyl phosphite
UN 2324 (DOT)	= Triisobutylene
UN 2364 (DOT)	= n-Propylbenzene
UN 2708 (DOT)	= 3-Methoxybutyl acetate
Un; do; tri; tetra; penta; or Hexa benzenesulfonic acid	= Alkyl(C <sub>11</sub> - C <sub>17</sub> )benzenesulfonic acid
UN2241 (DOT)	= Cycloheptane
UN2246 (DOT)	= Cyclopentene
UN2313 (DOT)	= 3-Methylpyridine
UN2313 (DOT)	= 4-Methylpyridine
n-Undecanoic acid	= Undecanoic acid
Undecanoic acid	= Undecanoic acid
Undecanol	= Undecanol
1-Undecanol	= Undecanol
1-Undecene	= 1-Undecene
n-Undecoic acid	= Undecanoic acid
Undecyl alcohol	= Undecanol
n-Undecylbenzene	= n-Undecylbenzene
Undecylethylene	= 1-Tridecene
n-Undecylic acid	= Undecanoic acid
Unipine	= Oil, misc: pine
Unslaked lime	= Calcium oxide
Uran, rustica	= Urea, ammonium nitrate soln (w/aqua ammonia)
Uranium acetate dihydrate	= Uranyl acetate
Uranium acetate	= Uranyl acetate
Uranium nitrate	= Uranyl nitrate
Uranium oxide (UO#m4)	= Uranium peroxide
Uranium oxide peroxide (UO#m2[O#m2])	= Uranium peroxide
Uranium oxyacetate dihydrate	= Uranyl acetate
Uranium peroxide	= Uranium peroxide
Uranium sulfate trihydrate	= Uranyl sulfate
Uranium sulfate	= Uranyl sulfate
Uranyl acetate dihydrate	= Uranyl acetate
Uranyl acetate	= Uranyl acetate
Uranyl nitrate	= Uranyl nitrate
Uranyl sulfate trihydrate	= Uranyl sulfate
Uranyl sulfate	= Uranyl sulfate
Urea hydrogen peroxide	= Urea peroxide
Urea peroxide	= Urea peroxide
Urea, ammonium nitrate soln (w/aqua ammonia)	= Urea, ammonium nitrate soln (w/aqua ammonia)
Urea, hydrogen peroxide salt	= Urea peroxide
Urea, thio-	= Thiocarbamide
Urea	= Urea
Urotropin	= Hexamethylenetetramine
USAF DO-45	= Acetal
USAF DO-46	= N-Aminoethyl piperazine
USAF ST40	= Methacrylonitrile
Valentinite	= Antimony trioxide
Valeral	= Valeraldehyde
n-Valeraldehyde	= n-Valeraldehyde
Valeraldehyde	= Valeraldehyde

SYNONYM	COMPOUND NAMES
Valeric acid	= Pentanoic acid
Valeric aldehyde	= n-Valeraldehyde
Valeric aldehyde	= Valeraldehyde
VAM	= Vinyl acetate
Vanadic anhydride	= Vanadium pentoxide
Vanadium oxide	= Vanadium oxide
Vanadium oxysulfate	= Vanadyl sulfate
Vanadium oxytrichloride	= Vanadium oxytrichloride
Vanadium pentaoxide	= Vanadium pentoxide
Vanadium pentoxide	= Vanadium oxide
Vanadium pentoxide	= Vanadium pentoxide
Vanadium(V) oxide	= Vanadium oxide
Vanadyl chloride	= Vanadium oxytrichloride
Vanadyl sulfate dihydrate	= Vanadyl sulfate
Vanadyl sulfate	= Vanadyl sulfate
Vanadyl trichloride	= Vanadium oxytrichloride
Vanicide	= Captan
Vanillan black liquor	= Vanillan black liquor
Vapona	= Dichlorvos
Vapotone	= Tetraethyl pyrophosphate
Vaseline	= Petrolatum
VCL	= Vinyl chloride
VCM	= Vinyl chloride
Vegetable carbon	= Charcoal
Velsicol 1068	= Chlordane
Velsicol	= Heptachlor
Ventox	= Acrylonitrile
Vermilion	= Mercuric sulfide
Versene acid	= Ethylenediamine tetracetic acid
Vidden D	= Dichloropropene, dichloropropane mixture
Vienna green	= Copper acetoarsenite
Vilrathane 4300	= Diphenylmethane diisocyanate
Vinamar	= Vinyl ethyl ether
Vinegar acid	= Acetic acid
Vinegar naphtha	= Ethyl acetate
4-Vinyl-1-cyclohexene	= Vinylcyclohexene
Vinyl A monomer	= Vinyl acetate
Vinyl acetate	= Vinyl acetate
Vinyl C monomer	= Vinyl chloride
Vinyl carbinol	= Allyl alcohol
Vinyl chloride	= Vinyl chloride
Vinyl cyanide	= Acrylonitrile
Vinyl ethyl ether	= Vinyl ethyl ether
Vinyl fluoride	= Vinyl fluoride
Vinyl formic acid	= Acrylic acid
Vinyl methyl ether	= Vinyl methyl ether
Vinyl neodecanoate	= Vinyl neodecanoate
Vinyl toluene	= Vinyl toluene
Vinyl trichloride	= 1,1,2-Trichloroethane
Vinylbenzene	= Styrene
Vinylcyclohexene	= Vinylcyclohexene
Vinylethylene	= Butadiene
Vinylidene chloride	= Vinylidene chloride

SYNONYM	COMPOUND NAMES
Vinylsilicon trichloride	= Vinyltrichlorosilane
Vinyltrichlorosilane	= Vinyltrichlorosilane
Vulkacit HX	= N-Ethylcyclohexylamine
VV 10 vinyl monomer	= Vinyl neodecanoate
Vyac	= Vinyl acetate
W-10	= Ethylene dibromide
W-15	= Ethylene dibromide
W-40	= Ethylene dibromide
Water displacing oil	= Oils, miscellaneous: penetrating
Water glass	= Sodium silicate
Waxes: carnauba	= Waxes: carnauba
Waxes: paraffin	= Waxes: paraffin
Weisspiessglanz	= Antimony trioxide
White arsenic	= Arsenic trioxide
White oil	= Oils, miscellaneous: mineral
White spirit (low (15-20%) aromatic)	= White spirit (low (15-20%) aromatic)
White vitriol	= Zinc sulfate
Witicizer 300	= Dibutyl phthalate
Wolfatox	= Methyl parathion
Wood alcohol	= Methyl alcohol
Wood charcoal	= Charcoal
Wood ether	= Dimethyl ether
Wood spirit	= Methyl alcohol
Wood turpentine	= Turpentine
Xenene	= Diphenyl
m-Xylene	= m-Xylene
o-Xylene	= o-Xylene
p-Xylene	= p-Xylene
Xylenol, phosphate (3:1)	= Trixylenyl phosphate
Xylenol	= Xylenol
2,6-Xylenol	= Xylenol
o-Xylidine	= 2,6-Dimethylaniline
2,6-Xylidine	= 2,6-Dimethylaniline
Xylol	= m-Xylene
Xylol	= o-Xylene
Xylol	= p-Xylene
Xylyl phosphate	= Trixylenyl phosphate
2,6-Xylylamine	= 2,6-Dimethylaniline
Yarmor pine oil	= Oil, misc: pine
Yarmor	= Oil, misc: pine
Yellow arsenic sulfide	= Arsenic trisulfide
Yellow petrolatum	= Petrolatum
Yellow phosphorus	= Phosphorus, white
Zactran	= Zectran
Zectane	= Zectran
Zectran	= Zectran
Zelio	= Thallium sulfate
Zextran	= Zectran
Zinc acetate dihydrate	= Zinc acetate
Zinc acetate	= Zinc acetate
Zinc ammonium chloride	= Zinc ammonium chloride
Zinc arsenate	= Zinc arsenate
Zinc bichromate	= Zinc bichromate
Zinc borate	= Zinc borate



SYNONYM	COMPOUND NAMES
Zinc bromide	= Zinc bromide
Zinc carbonate	= Zinc carbonate
Zinc chloride	= Zinc chloride
Zinc chromate (VI) hydroxide	= Zinc chromate
Zinc chromate	= Zinc chromate
Zinc cyanide	= Zinc cyanide
Zinc diacetate	= Zinc acetate
Zinc dialkyldithiophosphate	= Zinc dialkyldithiophosphate
Zinc dichromate	= Zinc bichromate
Zinc dicyanide	= Zinc cyanide
Zinc diethyl	= Diethylzinc
Zinc difluoride	= Zinc fluoride
Zinc dihexyldithiophosphate	= Zinc dialkyldithiophosphate
Zinc dihexylphosphorodithioate	= Zinc dialkyldithiophosphate
Zinc dimethyl	= Dimethylzinc
Zinc dithionite	= Zinc hydrosulfite
Zinc ethyl	= Diethylzinc
Zinc ethylenediaminetetraacetate	= Diammonium salt of zinc EDTA
Zinc fluoborate solution	= Zinc fluoroborate
Zinc fluoride	= Zinc fluoride
Zinc fluoroborate	= Zinc fluoroborate
Zinc fluosilicate	= Zinc silicofluoride
Zinc formate	= Zinc formate
Zinc hexafluorosilicate	= Zinc silicofluoride
Zinc hydrosulfite	= Zinc hydrosulfite
Zinc methyl	= Dimethylzinc
Zinc nitrate hexahydrate	= Zinc nitrate
Zinc nitrate	= Zinc nitrate
Zinc O,O-di-n-butylphosphorodithioate	= Zinc dialkyldithiophosphate
Zinc p-phenolsulfonate	= Zinc phenolsulfonate
Zinc phenolsulfonate octahydrate	= Zinc phenolsulfonate
Zinc phenolsulfonate	= Zinc phenolsulfonate
Zinc phosphide	= Zinc phosphide
Zinc potassium chromate	= Zinc potassium chromate
Zinc silicofluoride hexahydrate	= Zinc silicofluoride
Zinc silicofluoride	= Zinc silicofluoride
Zinc sulfate heptahydrate	= Zinc sulfate
Zinc sulfate	= Zinc sulfate
Zinc sulfocarbonate	= Zinc phenolsulfonate
Zinc sulfophenate	= Zinc phenolsulfonate
Zinc vitriol	= Zinc sulfate
Zinc yellow Y-539-D	= Zinc potassium chromate
Zinc yellow	= Zinc chromate
Zirconium acetate solution	= Zirconium acetate
Zirconium acetate	= Zirconium acetate
Zirconium chloride	= Zirconium tetrachloride
Zirconium nitrate pentahydrate	= Zirconium nitrate
Zirconium nitrate	= Zirconium nitrate
Zirconium oxide chloride	= Zirconium oxychloride
Zirconium oxychloride hydrate	= Zirconium oxychloride
Zirconium oxychloride	= Zirconium oxychloride
Zirconium potassium fluoride	= Zirconium potassium fluoride
Zirconium sulfate tetrahydrate	= Zirconium sulfate
Zirconium sulfate	= Zirconium sulfate

SYNONYM	COMPOUND NAMES
Zirconium tetrachloride solid (DOT)	= Zirconium tetrachloride
Zirconium tetrachloride	= Zirconium tetrachloride
Zirconyl chloride	= Zirconium oxychloride

## 9. INDEX OF CODES

AAC	Acetic acid	AMH	Ammonium hydroxide (<28% aqueous ammonia)
AAD	Acetaldehyde	AMK	n-Amyl methyl ketone
AAM	Acrylamide solution	AMM	n-Amyl mercaptan
AAN	n-Amyl alcohol	AMN	Ammonium nitrate
AAS	sec-Amyl acetate	AMP	Ammonium perchlorate
AAT	Ammonium acetate	AMR	Ammonium stearate
ABC	Ammonium bicarbonate	AMS	Ammonium sulfate
ABF	Ammonium bifluoride	AMT	Ammonium thiocyanate
ABM	Acetyl bromide	AMY	n-Amyl chloride
ABN	Alkyl (C <sub>11</sub> – C <sub>17</sub> ) benzenesulfonic acid	ANB	Ammonium bromide
ABR	Allyl bromide	ANI	iso-Amyl nitrite
ABZ	Ammonium benzoate	ANL	Aniline
ACA	Acetic anhydride	ANP	Ammonium nitrate-phosphate mixture
ACB	Ammonium carbonate	ANS	Ammonium nitrate-sulfate mixture
ACC	Acetyl chloride	ANT	n-Amyl nitrate
ACD	Acridine	ANU	Ammonium nitrate-urea solution
ACE	Acetylene	AOL	Ammonium oleate
ACF	Allyl chloroformate	AOX	Ammonium oxalate
ACH	Ammonium chromate	APB	Ammonium pentaborate
ACI	Ammonium citrate, dibasic	APC	Antimony pentachloride
ACL	Aluminum chloride	APE	Ammonium persulfate
ACM	Ammonium carbamate	APF	Antimony pentafluoride
ACN	Acrylonitrile	APH	Aluminum phosphide
ACO	Aluminum chloride solution	API	Ammonium picrate, wet
ACP	Acetophenone	APO	Arsenic pentaoxide
ACR	Acrylic acid	APP	Ammonium phosphate
ACT	Acetone	APR	2-Amino-2-methyl-1-propanol (90% or less)
ACY	Acetone cyanohydrin	APS	Acetyl peroxide solution
ADA	Adipic acid	APT	Antimony potassium tartrate
ADN	Adiponitrile	APY	4-Aminopyridine
AEC	Amyl acetate (all isomers)	ARD	Arsenic disulfide
AEE	Aminoethylethanolamine	ARF	Asphalt blending stocks: roofers flux
AEL	Acetal	ARL	Acrolein
AEP	N-Aminoethyl piperazine	ART	Arsenic trisulfide
AFB	Ammonium fluoborate	ARX	Arsenic
AFM	Ammonium formate	ASA	Arsenic acid
AFR	Ammonium fluoride	ASC	Anisoyl chloride
AGC	Ammonium gluconate	ASF	Ammonium sulfide
AHP	Ammonium hypophosphite	ASL	Ammonium silicofluoride
AID	Ammonium iodide	ASM	Ammonium sulfamate
ALA	Allyl alcohol	ASP	Asphalt
ALC	Allyl chloride	ASR	Asphalt blending stocks: straight run residue
ALD	Aldrin	AST	Arsenic trichloride
ALF	Aluminum fluoride	ASU	Ammonium bisulfite
ALM	Aluminum sulfate	ASX	Aluminum sulfate solution
ALN	Aluminum nitrate	ATA	Acetylacetone
ALS	Ammonium lauryl sulfate	ATB	Antimony tribromide
ALT	Ammonium lactate	ATC	Allyltrichlorosilane
AMA	Ammonia, anhydrous	ATF	Ammonium thiosulfate
AMB	Ammonium molybdate	ATH	Anthracene
AMC	Ammonium chloride		
AMD	Ammonium dichromate		
AMF	Ammonium sulfite		

ATL	Amyl phthalate	BNZ	Benzene
ATM	Antimony trichloride	BOC	Bismuth oxychloride
ATN	Acetonitrile	BPA	Bisphenol A
ATO	Arsenic trioxide	BPC	Barium perchlorate
ATR	Ammonium tartrate	BPD	Benzene phosphorus dichloride
ATS	n-Amyltrichlorosilane	BPE	2-Bromopentane
ATT	Antimony trifluoride	BPF	Bromine pentafluoride
ATV	Ammonium thiosulfate solution (60% or less)	BPH	Butyl benzyl phthalate
ATX	Antimony trioxide	BPM	Barium permanganate
ATZ	Atrazine	BPB	n-Butyl propionate
AYA	tert-Amyl acetate	BPO	Barium peroxide
AZM	Azinphos methyl	BPR	1-Bromopropane
BAB	Bromoacetyl bromide	BPT	Benzene phosphorus thiodichloride
BAC	Boric acid	BRA	n-Butyric acid
BAD	iso-Butyraldehyde	BRC	Barium carbonate
BAI	iso-Butyl acrylate	BRE	Bromoacetone
BAL	Benzyl alcohol	BRO	Bromoform
BAM	n-Butylamine	BRT	Boron trichloride
BAN	n-Butyl alcohol	BRU	Brucine
BAS	sec-Butyl alcohol	BRX	Bromine
BAT	tert-Butyl alcohol	BSC	Benzenesulfonyl chloride
BBR	Benzyl bromide	BTA	sec-Butyl acetate
BBT	2-Bromobutane	BTB	Boron tribromide
BBU	1-Bromobutane	BTC	n-butyl acrylate
BBZ	Bromobenzene	BTD	1,4-Butynediol
BCF	Benzyl chloroformate	BTF	Bromine trifluoride
BCL	Benzyl chloride	BTL	sec-Butylamine
BCN	n-Butyl acetate	BTM	n-Butyl mercaptan
BCP	Boiler compound, liquid	BTN	Butylene
BCR	Barium chlorate	BTO	1,2-Butylene oxide
BCS	Butyltrichlorosilane	BTP	p-tert-Butylphenol
BCY	Barium cyanide	BTR	n-Butyraldehyde
BDE	Bisphenol a diglycidyl ether	BUA	tert-Butylamine
BDI	Butadiene	BUB	Butyl butyrate
BDM	Benzyl dimethylamine	BUC	Butyryl chloride
BDO	1,4-Butanediol	BUD	1,4-Butenediol
BEC	Beryllium chloride	BUE	Butyl toluene
BEF	Beryllium fluoride	BUF	n-Valeraldehyde
BEM	Beryllium	BUG	Butylene glycol
BEN	Beryllium nitrate	BUT	Butane
BEO	Beryllium oxide	BYA	tert-Butyl acetate
BES	Beryllium sulfate	BYC	Butyl chloride
BFN	n-Butyl formate	BZA	Benzoic acid
BFO	n-Butyl chloroformate	BZC	Benzoyl chloride
BGE	n-Butyl glycidyl ether	BZD	Benzaldehyde
BHC	gamma Benzene hexachloride	BZE	Benzyl acetate
BHP	tert-Butyl hydroperoxide	BZI	Benzidine
BIB	Isobutyl isobutyrate	BZL	Benzal chloride
BLE	Butyl lactate	BZM	Benzylamine
BMA	Benzyltrimethylammonium chloride	BZN	Benzonitrile
BMI	Isobutyl methacrylate	BZO	Benzyltrimethyloctadecylammonium chloride
BMN	n-butyl methacrylate	BZP	Benzophenone
BNI	Butyronitrile	BZQ	p-Benzoquinone
BNP	2-Butanone peroxide	BZT	Benzenethiol
BNT	Barium nitrate	CAA	Copper acetoarsenite

CAC	Chloroacetyl chloride	CLP	3-Chloropropionic acid
CAF	Calcium fluoride	CLS	Caprolactam
CAH	Calcium hydroxide	CLT	Copper lactate
CAL	Calcium phosphate	CLX	Chlorine
CAM	Calcium	CMA	Chromic anhydride
CAO	Calcium oxide	CMB	Cadmium bromide
CAP	p-Chloroaniline	CMC	Chromyl chloride
CAR	Carene	CME	Chloromethyl methyl ether
CAS	Calcium arsenite	CMH	Cumene hydroperoxide
CAT	Cadmium acetate	CMN	Cadmium nitrate
CBA	Cobalt acetate	CMO	Carbon monoxide
CBB	Carbon disulfide	CMP	p-Cymene
CBC	Cobalt chloride	CMS	Cadmium sulfate
CBD	Copper bromide (ous)	CNE	1-Chloro-1-nitropropane
CBF	Carbofuran	CNI	Copper nitrate
CBN	4-Chlorobutyronitrile	CNN	Copper naphthenate
CBO	Carbolic oil (mixture)	CNO	o-Chloronitrobenzene
CBR	Cyanogen bromide	CNT	Calcium nitrate
CBS	Cobalt sulfate	COB	Cobalt bromide (ous)
CBT	Carbon tetrachloride	COF	Cobalt fluoride
CBY	Carbaryl	COL	Copper oxalate
CCA	Calcium arsenate	COP	Copper acetate
CCB	Calcium carbide	COS	Cobalt sulfamate
CCC	Calcium chlorate	COU	Coumaphos
CCH	Cyclohexanone	COX	Cadmium oxide
CCL	Cyanogen chloride	CPA	Copper arsenite
CCN	Calcium cyanide	CPB	Copper bromide
CCO	Cobalt nitrate	CPC	Copper chloride
CCP	Calcium peroxide	CPE	Cyclopentene
CCR	Calcium chromate	CPF	Copper fluoroborate
CCT	Creosote, coal tar	CPG	Copper glycinate
CCY	Copper cyanide (ous)	CPH	Camphene
CDA	Cacodylic acid	CPL	Chloropicrin
CDC	Cadmium chloride	CPN	p-Chlorophenol
CDN	Chlordane	CPO	Camphor oil
CDO	Carbon dioxide	CPP	Calcium phosphide
CES	Cupriethylenediamine solution	CPR	Cyclopropane
CFB	Cadmium fluoroborate	CPS	Caustic potash solution
CFM	Cobalt formate	CPT	Captan
CGE	Cresyl glycidyl ether	CRA	Chloroacetophenone
CHA	Cyclohexylamine	CRB	Chlorobenzene
CHC	Charcoal	CRC	Chromous chloride
CHD	Chlorohydrins	CRE	Calcium resinate
CHM	Chloroacetic acid (80% or less)	CRF	Chloroform
CHN	Cyclohexanol	CRH	o-Chlorophenol
CHO	Chloroacetaldehyde	CRL	m-Cresol
CHP	Cyclohexanone peroxide	CRN	p-Chlorotoluene
CHS	Chromic sulfate	CRO	o-Cresol
CHT	Cyclohexenyltrichlorosilane	CRP	Chloroprene
CHX	Cyclohexane	CRS	Cresols
CHY	Calcium hypochlorite	CRT	Chromic acetate
CID	Copper iodide	CSA	Chlorosulfonic acid
CIT	Citric acid	CSC	Cresylate spent caustic solution
CLA	2-Chloropropionic acid	CSF	Copper sulfate
CLC	Calcium chloride	CSN	Copper sulfate, ammoniated
CLD	Collodion	CSO	p-Cresol

CSS	Caustic soda solution	DCM	Dichloromethane
CST	Copper subacetate	DCO	Decanoic acid
CSY	Corn syrup	DCP	2,4-Dichlorophenol
CTA	Crotonaldehyde	DCR	N,N-Dimethylcarbamoyl chloride
CTC	Catechol	DCS	Dodecylbenzenesulfonic acid, calcium salt
CTD	4-Chloro-o-toluidine	DCT	1,1-Dichloro-1-nitroethane
CTF	Chlorine trifluoride	DCV	Dichlorvos
CTM	m-Chlorotoluene	DCY	4,6-Dinitro-o-cyclohexyl phenol
CTO	o-Chlorotoluene	DDB	Dodecylbenzene
CTP	Coal tar pitch	DDC	1-Dodecene
CTT	Copper tartrate	DDD	DDD
CUF	Copper formate	DDI	2,2-Dimethylpropane-1,3-diol
CUM	Cumene	DDM	Dodecylmethacrylate
CWD	Creosote (wood)	DDN	Dodecanol
CXY	Carbon oxyfluoride	DDP	Dodecyl/pentadecyl methacrylate
CYA	Cyanoacetic acid	DDS	Dodecyl sulfate, sodium salt
CYC	Cyclohexyl acetate	DDT	DDT
CYE	Cycloheptane	DDW	Dimethylhexane dihydroperoxide
CYG	Cyanogen	DEA	Diethanolamine
CYP	Cyclopentane	DEB	Diethylbenzene
CYT	1,5,9-Cyclododecatriene	DEC	Diethyl carbonate
DAA	Diacetone alcohol	DED	Dieldrin
DAC	Dimethylacetamide	DEE	2,2-Dichloroethyl ether
DAE	N,N-Diethylethanolamine	DEG	Diethylene glycol
DAI	Dodecylbenzenesulfonic acid, isopropylamine salt	DEH	Di-(2-ethylhexyl) adipate
DAL	Decaldehyde	DEK	Diethyl ketone
DAM	Diphenylamine	DEL	1,2-Dichloroethylene
DAN	n-Decyl alcohol	DEM	Diethylene glycol monobutyl ether acetate
DAP	Di-n-amyl phthalate	DEN	Diethylamine
DAR	n-Decyl acrylate	DEP	Di-(2-ethylhexyl)phosphoric acid
DAS	Dodecyl benzene sulfonic acid, sodium salt	DER	Butyl, decyl, cetyl-eicosyl methacrylate
DBA	Di-n-butylamine	DES	2,4-D esters
DBC	Diisobutylcarbinol	DET	Diethylenetriamine
DBE	Di-n-butyl ether	DEZ	Diethylzinc
DBH	Dibromomethane	DFA	Difluorophosphoric acid
DBK	Di-n-butyl ketone	DFE	1,1-Difluoroethane
DBL	Diisobutylene	DFP	Distillates: flashed feed stocks
DBM	m-Dichlorobenzene	DFM	Dichloromonofluoromethane
DBN	Dibenzyl ether	DGA	Diethylene glycol ethyl ether acetate
DBO	o-Dichlorobenzene	DGD	Diethylene glycol dimethyl ether
DBP	p-Dichlorobenzene	DGE	Diethylene glycol monoethyl ether
DBR	Decaborane	DGL	Diethylene glycol phthalate
DBS	Dodecylbenzenesulfonic acid, triethanolamine salt	DGM	Diethylene glycol monomethyl ether
DBT	Dibutylphenol	DGR	Diethylene glycol methyl ether acetate
DBU	Diisobutylamine	DGT	Dimethyl glutarate
DBZ	n-Decylbenzene	DGY	Dipropylene glycol dibenzoate
DCA	2,4-Dichlorophenoxyacetic acid	DHA	Di-n-hexyl adipate
DCB	Dichlorobutene	DHE	Diethylene glycol n-hexyl ether
DCC	Decane	DHN	Decahydronaphthalene
DCE	1-Decene	DHP	Diheptyl phthalate
DCF	Dichlorodifluoromethane	DHX	1,6-Dichlorohexane
DCH	1,1-Dichloroethane	DIA	Diisopropylamine
DCI	2,2'-Dichloroisopropyl ether	DIB	Dichlobenil
DCL	Dichlone	DIC	Dicamba
		DID	Diisodecyl phthalate
		DIE	Di-(2-ethylhexyl)phthalate

DIF	Dinonyl phthalate	DPE	Diphenyl ether
DIG	Diethylene glycol dibutyl ether	DPF	2,3-Dichloropropene
DIH	Diisopropylbenzene hydroperoxide	DPG	Dipropylene glycol
DII	Diisopropyl naphthalene	DPH	Diethyl phthalate
DIK	Diisobutyl ketone	DPI	Dimethyl hydrogen phosphite
DIL	Diphenyl	DPM	Diphenylmethane diisocyanate
DIM	Dimethyl ether	DPN	Dipentene
DIN	Diisononyl phthalate	DPO	Dibenzoyl peroxide
DIO	Diisooctyl phthalate	DPP	1,2-Dichloropropane
DIP	Diisopropanolamine	DPT	Dicyclopentadiene
DIQ	Diquat	DPU	1,3-Dichloropropene
DIS	Disulfoton	DPY	Dipropylene glycol methyl ether
DIT	Diisobutyl phthalate	DSA	Dodecylbenzenesulfonic acid
DIU	Diuron	DSD	Dodecyl sulfate, diethanolamine salt
DIX	Diisopropylbenzene (all isomers)	DSE	Dimethyl succinate
DLA	Dimethyl adipate	DSF	Dimethyl sulfate
DLP	2,2-Dichloropropanoic acid	DSL	Dimethyl sulfide
DLS	N,N-Dimethyl acetamide solution (40% or less)	DSM	Dodecyl sulfate, magnesium salt
DMA	Dimethylamine	DSR	Distillates: straight run
DMB	Dimethylethanolamine	DSS	Diocetyl sodium sulfosuccinate
DMD	Dimethyldichlorosilane	DST	Dodecyl sulfate, triethanolamine salt
DME	Diethylene glycol monobutyl ether	DSU	Diethyl sulfate
DMF	Dimethylformamide	DSZ	Diammonium salt of zinc edta
DMH	1,1-Dimethylhydrazine	DTC	Dodecyltrichlorosilane
DML	1,2-Dimethylhydrazine	DTE	Dichlorotetrafluoroethane
DMM	2,6-Dimethylaniline	DTH	Dowtherm
DMN	2,6-Diethylaniline	DTL	Dimethyl phthalate
DMO	2,2-Dimethyloctanoic acid	DTM	4,4'-Dichloro-alpha-trichloromethyl benzhydrol
DMP	Dimethylpolysiloxane	DTN	Demeton
DMS	Dimethyl sulfoxide	DTP	Ditridecyl phthalate
DMT	Dimethyl terephthalate	DTS	Dextrose solution
DMX	Dichloropropene, dichloropropane mixture	DTT	2,4-Dinitrotoluene
DMZ	Dimethylzinc	DUP	Diundecyl phthalate
DNA	Di-n-propylamine	DUR	Dursban
DNB	m-Dinitrobenzene	DXN	N,n-Dimethylcyclohexylamine
DNC	Dinitrocresol	DZN	Diazinon
DNE	2,5-Dinitrophenol	DZP	Di-(p-chlorobenzoyl) peroxide
DNH	2,6-Dinitrophenol	EAA	Ethyl acetoacetate
DNL	2,6-Dinitrotoluene	EAC	Ethyl acrylate
DNO	o-Dinitrobenzene	EAD	Ethylaluminum dichloride
DNP	2,4-Dinitrophenol	EAI	2-Ethylhexyl acrylate
DNT	2,4-Dinitroaniline	EAK	Ethyl amyl ketone
DNU	3,4-Dinitrotoluene	EAL	Ethyl alcohol
DNY	Diisononyl adipate	EAM	Ethylamine
DNZ	p-Dinitrobenzene	EAS	Ethylaluminum sesquichloride
DOA	Diocetyl adipate	EBA	N-Ethyl-n-butylamine
DOD	Dodecene	EBK	Ethyl butyl ketone
DOL	Dodecyl phenol	EBR	Ethyl butyrate
DOP	Diocetyl phthalate	EBT	Ethyl butanol
DOS	Dodecyl diphenyl ether disulfonate solution	ECA	Ethyl chloroacetate
DOX	1,4-Dioxane	ECC	N-Ethylcyclohexylamine
DPA	Dibutyl phthalate	ECF	Ethyl chloroformate
DPB	1,1-Dichloropropane	ECH	Ethylene chlorohydrin
DPC	1,3-Dichloropropane	ECL	Ethyl chloride
DPD	Diphenyldichlorosilane	ECS	Ethyldichlorosilane

ECT	Ethyl chlorothioformate	ETC	Ethylene cyanohydrin
ECY	Ethyl cyclohexane	ETD	Ethoxylated tridecanol
EDA	Ethylenediamine	ETE	2-Ethyl toluene
EDB	Ethylene dibromide	ETG	Ethoxy triglycol
EDC	Ethylene dichloride	ETH	Ethane
EDR	Endrin	ETI	Ethyleneimine
EDT	Ethylenediamine tetracetic acid	ETL	Ethylene
EEA	2-Ethoxyethyl acetate	ETM	Ethyl methacrylate
EEE	Ethylene glycol diethyl ether	ETN	Ethyl nitrite
EEO	2-Ethoxyethanol	ETO	Ethion
EEP	Ethyl-3-ethoxypropionate	ETS	Ethyltrichlorosilane
EET	Ethyl ether	EVO	Epoxidized vegetable oils
EFM	Ethyl formate	FAC	Ferric ammonium citrate
EGA	Ethylene glycol monoethyl ether acetate	FAL	Furfuryl alcohol
EGB	Ethylene glycol dibutyl ether	FAM	Formamide
EGD	Ethylene glycol dimethyl ether	FAN	2-Fluoroaniline
EGE	Ethylene glycol monoethyl ether	FAO	Ferric ammonium oxalate
EGI	Ethylene glycol isopropyl ether	FAS	Ferrous ammonium sulfate
EGL	Ethylene glycol	FCL	Ferric chloride
EGM	Ethylene glycol monobutyl ether	FCP	Ferric glycerophosphate
EGO	Ethylene glycol acetate	FEC	Ferrous chloride
EGP	Ethylene glycol propyl ether	FFA	Furfural
EGT	Ethylene glycol methyl ether acetate	FFB	Ferrous fluoroborate
EGY	Ethylene glycol diacetate	FFX	Ferric fluoride
EHA	Ethylhexaldehyde	FLA	4-Fluoroaniline
EHC	2-Ethylhexyl acetate	FLB	Fluorobenzene
EHE	Ethyl hexyl phthalate	FLT	2-Fluorotoluene
EHM	2-Ethylhexylamine	FMA	Formic acid
EHO	2-Ethylhexanoic acid	FMS	Formaldehyde solution
EHP	Ethoxydihydropyran	FNT	Ferric nitrate
EHT	Ethyl hexyl tallate	FOX	Ferrous oxalate
EHX	2-Ethyl hexanol	FPS	Ferrophosphorus
ELT	Ethyl lactate	FRS	Ferrous sulfate
EMA	Ethylene glycol monobutyl ether acetate	FSA	Fluosulfonic acid
EMC	Ethyl mercaptan	FSF	Ferric sulfate
EME	Ethylene glycol monomethyl ether	FSL	Fluosilicic acid
EMN	n-Ethyl morpholine	FSN	Ferrosilicon
EMX	Ethylenediamine	FTO	3-Fluorotoluene
ENB	Ethylidene norbornene	FTU	4-Fluorotoluene
ENP	Ethoxylated nonylphenol	FUM	Fumaric acid
EOD	Ethoxylated dodecanol	FUR	Furan
EOP	Ethoxylated pentadecanol	FXX	Fluorine
EOT	Ethoxylated tetradecanol	GAC	Glyoxylic acid (50% or less)
EOX	Ethylene oxide	GAK	Gasoline blending stocks: alkylates
EPA	2-Ethyl-3-propylacrolein	GAT	Gasolines: automotive (<4.23g lead/gal)
EPC	Epichlorohydrin	GAV	Gasolines: aviation (< 4.86g lead/gal)
EPD	Ethyl phosphonothioic dichloride	GCM	Glycidyl methacrylate
EPE	Ethylene glycol phenyl ether	GCR	Glycerine
EPL	Ethylphenol	GCS	Gasolines: casinghead
EPP	Ethyl phosphorodichloridate	GLA	Gallic acid
EPR	Ethyl propionate	GOC	Gas oil: cracked
EPS	Ethylphenyldichlorosilane	GOS	Glyoxal
ESC	Ethyl silicate	GPL	Gasolines: polymer
ESF	Endosulfan	GRF	Gasoline blending stocks: reformates
ETA	Ethyl acetate	GSR	Gasolines: straight run
ETB	Ethylbenzene	GTA	Glutaraldehyde solution



HAC	Hexadecyltrimethylammonium chloride	IOC	Isooctaldehyde
HAE	Hexyl acetate	IPA	Isopropyl alcohol
HAI	2-Hydroxyethyl acrylate	IPC	Isopropyl percarbonate
HAL	n-Hexaldehyde	IPD	Isophorone diisocyanate
HAS	Hydroxylamine sulfate	IPE	Isopropyl ether
HBA	2-Hydroxy-4-(methylthio)-butanoic acid	IPH	Isophorone
HBR	Hydrogen bromide	IPI	Isophorone diamine
HCB	Hexachlorobutadiene	IPL	Isophthalic acid
HCC	Hexachlorocyclopentadiene	IPM	Isopropyl mercaptan
HCE	Hexachloroethane	IPP	Isopropylamine
HCL	Hydrochloric acid	IPR	Isoprene
HCN	Hydrogen cyanide	IPT	Isopentane
HCP	Hexachlorophene	IPX	Isopropyl cyclohexane
HCZ	Hexachlorobenzene	ISA	Isodecyl alcohol
HDA	Hydroxylamine	ISP	o-Isopropyl phenol
HDC	Hydrogen chloride	IVA	Isovaleraldehyde
HDQ	Hydroquinone	JPF	Jet fuels: JP-4
HDS	Hydrogen sulfide	JPO	Jet fuels: JP-1
HDZ	Hydrazine	JPT	Jet fuels: JP-3
HEP	Heptanoic acid	JPV	Jet fuels: JP-5
HFA	Hydrofluoric acid	KPE	Kepone
HFS	Hydrofluorosilicic acid (25% or less)	KRS	Kerosene
HFX	Hydrogen fluoride	LAC	Lead acetate
HMD	Hexamethylenediamine	LAH	Lithium aluminum hydride
HMI	Hexamethylenimine	LAL	Linear alcohols
HMT	Hexamethylenetetramine	LAR	Lead arsenate
HPA	Hydroxypropyl acrylate	LBC	Lithium bichromate
HPE	Heptyl acetate	LCL	Lead chloride
HPM	Hydroxypropyl methacrylate	LCR	Lithium chromate
HPO	Hydrogen peroxide	LFB	Lead fluoroborate
HPT	Heptane	LFR	Lead fluoride
HSS	Hexadecyl sulfate, sodium salt	LHD	Lithium hydride
HTC	Heptachlor	LID	Lead iodide
HTE	1-Heptene	LLS	Latex, liquid synthetic
HTN	Heptanol	LNG	Liquefied natural gas
HXA	n-Hexane	LNI	Lactonitrile solution (80% or less)
HXE	1-Hexene	LNT	Lead nitrate
HXG	Hexylene glycol	LPG	Liquefied petroleum gas
HXN	1-Hexanol	LPO	Lauroyl peroxide
HXO	Hexanoic acid	LRA	Lauric acid
HXX	Hydrogen	LRM	Lauryl mercaptan
IAA	Isoamyl alcohol	LSA	Lead stearate
IAC	Isopropyl acetate	LSF	Lead sulfate
IAI	Isodecyl acrylate	LSU	Lead sulfide
IAL	Isobutyl alcohol	LTA	Lactic acid
IAM	Isobutylamine	LTC	Lead thiocyanate
IAT	Isoamylacetate	LTH	Litharge
IBA	Isobutyl acetate	LTM	Lithium
IBL	Isobutylene	LTS	Lead thiosulfate
IBN	Isobutyronitrile	LTT	Lead tetraacetate
IBR	Isobutyric acid	LTU	Lead tungstate
IBT	Isobutane	MAA	Methyl amyl alcohol
IDA	Isodecaldehyde	MAC	Methyl amyl acetate
IGE	Isopropyl glycidyl ether	MAD	Methacrylic acid
IHA	Isohexane	MAE	Methyl acetoacetate
IOA	Isooctyl alcohol	MAK	Methylamyl ketone

MAL	Methyl alcohol	MLI	Maleic acid
MAM	Methyl acrylate	MLL	Methyl allyl alcohol
MAN	N-methylaniline	MLP	3-Methylpyridine
MAP	Methyl acetylene, propadiene mixture	MLT	Malathion
MAT	Mercuric acetate	MMC	Methyl mercaptan
MBA	a-Methylbenzyl alcohol	MME	Monomethyl ethanolamine
MBE	Methyl tert-butyl ether	MMM	Methyl methacrylate
MBK	Methyl n-butyl ketone	MNA	1-Methylnaphthalene
MBL	Methyl butenol	MNS	Mineral spirits
MBO	3-Methyl-2-butanone	MNT	Mercuric nitrate
MBU	Methyl butyrate	MOA	3-Methoxybutyl acetate
MBY	Methyl butynol	MOC	Methoxychlor
MBZ	Methyl benzoate	MOX	Mercuric oxide
MCA	Chloroacetic acid	MPA	Monoisopropanolamine
MCC	Mercuric ammonium chloride	MPC	Magnesium perchlorate
MCD	Mercaptodimethur	MPD	Methyl phosphonothioic dichloride
MCF	Chlorodifluoromethane	MPE	2-Methyl-1-pentene
MCK	Methylcyclopentadiene dimer	MPF	4-Methylpyridine
MCL	Methallyl chloride	MPK	Methyl isopropenyl ketone
MCM	Monochlorotrifluoromethane	MPL	Morpholine
MCN	Mercuric cyanide	MPR	2-Methylpyridine
MCO	Metolachlor	MPT	Methyl parathion
MCP	Methyl cyclopentane	MPY	1-Methylpyrrolidone
MCR	Mercury	MRC	Mercuric chloride
MCS	Methyldichlorosilane	MRE	Myrcene
MCT	Methylcyclopentadienylmanganese tricarbonyl	MRN	Mercurous nitrate
MCX	o-Methylcyclohexanone	MRR	Mercurous chloride
MCY	Methylcyclohexane	MRS	Mercuric sulfate
MDC	Methyl dichloroacetate	MRT	Mercuric thiocyanate
MDE	Methyl diethanolamine	MRX	Mirex
MEA	Monoethanolamine	MSA	Methanearsonic acid, sodium salt
MED	Methyl chloroacetate	MSF	Mercuric sulfide
MEK	Methyl ethyl ketone	MSO	Mesityl oxide
MEN	2-Methyl-6-ethyl aniline	MSR	alpha-Methylstyrene
MEP	Methylethylpyridine	MSZ	Methylamine solution
MES	Methyl salicylate	MTA	Methylamine
MET	Methacrylonitrile	MTB	Methyl bromide
MFA	Lead alkyls	MTC	Methyl chloride
MFM	Methyl formate	MTE	Monochlorotetrafluoroethane
MGN	Magnesium nitrate	MTF	Methyl formal
MGX	Magnesium	MTH	Methane
MHB	2-Methyl-2-hydroxy-3-butyne	MTN	4-Methyl-1-pentene
MHC	Methyl chloroformate	MTO	Molybdic trioxide
MHK	Methyl heptyl ketone	MTS	Methyltrichlorosilane
MHX	2-Methylcyclohexanol	MTT	Methyl acetate
MHZ	Methylhydrazine	MVK	Methyl vinyl ketone
MIC	Methyl isobutyl carbinol	NAA	Nitrilotriacetic acid and salts
MID	Mercuric iodide	NAB	Nabam
MIK	Methyl isobutyl ketone	NAC	Nitric acid
MIO	Methyl iodide	NAE	Nonyl acetate
MIS	Methyl isocyanate	NAL	4-Nitroaniline
MIT	Methyl isothiocyanate	NAN	Nonane
MKE	Methyl propyl ketone	NAO	1-Naphthylamine
MLA	Maleic anhydride	NAS	Nickel ammonium sulfate
MLH	Maleic hydrazide	NBR	Nickel bromide
		NCL	Nickel chloride

NCN	Nickel cyanide	OET	Octyl epoxy tallate
NCS	Nicotine sulfate	OFR	Oils, fuel: 4
NCT	Naphtha: coal tar	OFS	Oils, edible: fish
NEA	Neodecanoic acid	OFV	Oils, fuel: 5
NFB	Nickel fluoroborate	OIL	Oils: crude
NFM	Nickel formate	OLA	Oleic acid
NHX	Neohexane	OLB	Oils, miscellaneous: lubricating
NIC	Nicotine	OLD	Oils, edible: lard
NIE	o-Nitrotoluene	OLM	Oleum
NIP	3-Nitrophenol	OLS	Oils, miscellaneous: linseed
NKA	Nickel acetate	OMN	Oils, miscellaneous: mineral
NKC	Nickel carbonyl	OMS	Oils, miscellaneous: mineral seal
NKH	Nickel hydroxide	OMT	Oils, miscellaneous: motor
NKS	Nickel sulfate	ONF	Oils, miscellaneous: neatsfoot
NLD	Naled	OOD	Oils, fuel: 1-D
NMT	Nitromethane	OOL	Oils, edible: olive
NNE	1-Nonene	OON	Oils, fuel: no. 1
NNN	Nonanol	OPI	Oil, misc: pine
NNP	Nonylphenol	OPM	Oils, edible: palm
NNT	Nickel nitrate	OPN	Oils, edible: peanut
NON	Nonene	OPT	Oils, miscellaneous: penetrating
NOX	Nitrogen tetroxide	ORD	Oils, miscellaneous: road
NPH	4-Nitrophenol	ORG	Oils, miscellaneous: range
NPN	1-Nitropropane	ORN	Oils, miscellaneous: rosin
NPP	2-Nitropropane	ORS	Oils, miscellaneous: resin
NSS	Naphtha: stoddard solvent	OSB	Oils, edible: soya bean
NSV	Naphtha: solvent	OSD	Oils, miscellaneous: spindle
NTA	2-Nitroaniline	OSF	Oils, edible: safflower
NTB	Nitrobenzene	OSP	Oils, miscellaneous: sperm
NTC	Nitrosyl chloride	OSX	Oils, fuel: no. 6
NTE	Nitroethane	OSY	Oils, miscellaneous: spray
NTI	Naphthenic acids	OTA	Octanol
NTL	Nitralin	OTB	Oils, miscellaneous: turbine
NTM	Naphthalene	OTC	Oils, edible: tucum
NTO	Nitrous oxide	OTD	Oils, fuel: 2-D
NTP	2-Nitrophenol	OTE	1-Octene
NTR	m-Nitrotoluene	OTF	Oils, miscellaneous: transformer
NTT	p-Nitrotoluene	OTL	Oils, miscellaneous: tall
NTX	Nitric oxide	OTN	Oils, miscellaneous: tanner's
NVM	Naphtha: VM & P	OTW	Oils, fuel: 2
NXX	Nitrogen	OVG	Oils, edible: vegetable
OAA	Octanoic acid	OXA	Oxalic acid
OAC	Oleic acid, sodium salt	OXY	Oxygen
OAL	Octyl aldehydes	PAA	Peracetic acid
OAN	Octane	PAC	Phosphoric acid
OAP	Oleic acid, potassium salt	PAD	Propionaldehyde
OAS	Oils, miscellaneous: absorption	PAH	Propionic anhydride
OCA	Oils, edible: castor	PAL	n-Propyl alcohol
OCC	Oils, edible: coconut	PAM	2-Propanolamine
OCF	Oils: clarified	PAN	Phthalic anhydride
OCN	Oil, misc: cashew nut shell	PAS	Potassium arsenate
OCR	Oils, miscellaneous: croton	PAT	n-Propyl acetate
OCS	Oils, edible: cottonseed	PBO	Potassium binoxalate
OCT	Oils, miscellaneous: coal tar	PBP	Propylene butylene polymer
ODP	Octyl decyl phthalate	PBR	Phosphorus tribromide
ODS	Oils: diesel	PBZ	n-Propylbenzene

PCB	Polychlorinated biphenyl	PPT	Phosphorus trichloride
PCE	Pentachloroethane	PPW	Phosphorus, white
PCH	Potassium chromate	PPZ	Piperazine
PCL	Perchloric acid	PRA	n-Propylamine
PCM	Perchloromethyl mercaptan	PRC	n-Propyl chloride
PCN	Propionitrile	PRD	Pyridine
PCP	Pentachlorophenol	PRE	n-Propyl ether
PCR	Potassium chlorate	PRG	Propargite
PDC	Pentadecanol	PRO	Propargyl alcohol
PDE	1,3-Pentadiene	PRP	Propane
PDH	Paraldehyde	PRR	Pyrethrins
PDL	Phenyldichloroarsine	PTA	Pentane
PDN	1,4-Pentadiene	PTB	Pentaborane
PDT	Potassium dichloro-s-triazinetriene	PTC	Potassium cyanide
PEB	Polyethylene polyamines	PTD	Potassium dichromate
PEN	Pentaethylenehexamine	PTE	1-Pentene
PET	Pentaerythritol	PTH	Potassium hydroxide
PFA	Paraformaldehyde	PTI	Potassium iodide
PGA	Pyrogalllic acid	PTL	Petrolatum
PGC	Polypropylene glycol	PTM	Potassium
PGM	Polypropylene glycol methyl ether	PTN	Petroleum naphtha
PGN	Propylene glycol methyl ether acetate	PTO	Parathion
PGY	Propylene glycol ethyl ether	PTP	Potassium permanganate
PHD	Phosdrin	PTR	Propylene trimer
PHE	Phenylhydrazine	PTS	Potassium oxalate
PHG	Phosgene	PTT	Propylene tetramer
PHH	Phenylhydrazine hydrochloride	PXE	1-Phenyl-1-xylyl ethane
PHN	Phenol	PXP	n-Propoxypropanol
PII	Propyleneimine	QNL	Quinoline
PIN	Pinene	RSC	Resorcinol
PLA	n-Propanolamine	SAB	Sodium alkylbenzenesulfonates
PLB	Polybutene	SAC	Sulfuric acid, spent
PLP	Polypropylene	SAL	Salicylaldehyde
PLT	beta-Propiolactone	SAM	Sodium amide
PMA	Phenylmercuric acetate	SAR	Sodium arsenite
PME	Propylene glycol methyl ether	SAS	Sodium alkyl sulfates
PMN	n-Propyl mercaptan	SAT	Sodium fluoroacetate
PNA	Propionic acid	SAU	Sodium aluminate solution (45% or less)
PNE	2-Pentanone	SAZ	Sodium azide
PNI	n-Propyl nitrate	SBF	Sodium bifluoride
PNR	Potassium nitrate	SBH	Sodium borohydride
POA	Potassium arsenite	SBS	Sodium bisulfite
POC	Pentanoic acid	SBT	Sorbitol
POE	Potassium oleate	SBX	Sodium hydroxide solution
POP	Potassium peroxide	SCD	Sodium cacodylate
POX	Propylene oxide	SCH	Sodium chromate
PPA	Polyphosphoric acid	SCL	Sulfuryl chloride
PPB	Phosphorus, black	SCM	Strontium chromate
PPD	Propanedinitrile	SCN	Sodium cyanide
PPE	n-Pentyl propionate	SCR	Sodium dichromate
PPG	Propylene glycol	SCY	Sodium thiocyanate
PPI	Polymethylene polyphenyl isocyanate	SDA	Sodium arsenate
PPL	Propylene	SDB	Sodium borate
PPO	Phosphorus oxychloride	SDC	Sodium chlorate
PPP	Phosphorus pentasulfide	SDD	Sodium chlorate solution
PPR	Phosphorus, red	SDF	Sodium fluoride

SDH	Sodium hydride	TCB	1,2,4-Trichlorobenzene
SDN	Sodium nitrate	TCE	Trichloroethane
SDS	Sodium sulfide	TCF	Trichlorofluoromethane
SDT	Sodium dichloro-s-triazinetriene	TCH	Trichloroacetaldehyde
SDU	Sodium	TCL	Trichloroethylene
SFA	Sulfuric acid	TCM	1,1,2-Trichloroethane
SFC	Sodium ferrocyanide	TCN	1,2,3-Trichloropropane
SFD	Sulfur dioxide	TCO	Tricresyl phosphate ( $\geq 1\%$ ortho isomer)
SFL	Sulfolane	TCP	Tricresyl phosphate ( $<1\%$ ortho isomer)
SFM	Sulfur monochloride	TCS	Trichlorosilane
SFR	Sodium silicofluoride	TCT	Trichloro-s-triazinetriene
SHC	Sodium hypochlorite	TDA	Toluenediamine
SHD	Sodium hydroxide	TDB	Tetradecylbenzene
SHP	Sodium hypochlorite solution	TDC	1-Tridecene
SHR	Sodium hydrosulfide solution	TDI	Toluene 2,4-diisocyanate
SHX	Sodium hydrogen sulfite solution (35% or less)	TDN	Tridecanol
SLA	Salicylic acid	TEA	Triethanolamine
SLD	Selenium dioxide	TEB	Triethylbenzene
SMB	Sodium 2-mercaptobenzothiazol solution	TEC	Tetrachloroethane
SML	Sodium methylate	TED	Tetraethyl dithiopyrophosphate
SNI	Sodium nitrite solution	TEG	Triethylene glycol
SNT	Sodium nitrite	TEL	Tetraethyl lead
SOX	Sodium oxalate	TEN	Triethylamine
SPC	Sodium pentachlorophenate	TEP	Tetraethyl pyrophosphate
SPH	Sodium phosphate, tribasic	TES	2,4,5-T esters
SPP	Sodium phosphate	TET	Triethylenetetramine
SRA	Stearic acid	TFA	Tallow fatty alcohol
SRS	Sucrose	TFC	Trifluorochloroethylene
SSC	Sodium silicate	TFE	Tetrafluoroethylene
SSE	Sodium selenite	TFR	Trifluralin
SSF	Sodium sulfite	TGC	Tripropylene glycol
STC	Silicon tetrachloride	TGD	Triethylene glycol di-(2-ethylbutyrate)
STF	Stannous flouride	TGE	Triethylene glycol ethyl ether
STN	Strontium nitrate	TGM	Tripropylene glycol methyl ether
STO	Selenium trioxide	TGY	Triethylene glycol methyl ether
STR	Strychnine	THA	Trimethyl hexamethylene diamine
STS	Sodium thiocyanate solution (56% or less)	THB	Thallium carbonate
STY	Styrene	THC	Thiocarbamide
SVA	Silver acetate	THF	Tetrahydrofuran
SVC	Silver carbonate	THI	Trimethylhexamethylene diisocyanate
SVF	Silver fluoride	THN	Tetrahydronaphthalene
SVI	Silver iodate	THR	Thiram
SVN	Silver nitrate	TIA	Triisobutylaluminum
SVO	Silver oxide	TIB	Triisobutylene
SVS	Silver sulfate	TIP	Triisopropanolamine
SXX	Sulfur	TLA	Thallium acetate
TAA	Trimethylacetic acid	TLI	o-Toluidine
TAL	Triethylaluminum	TLO	Tallow
TAP	p-Toluenesulfonic acid	TMA	Trimethylamine
TAS	2,4,5-Trichlorophenoxyacetic acid, sodium salt	TMC	Trimethylchlorosilane
TBP	Tributyl phosphate	TME	1,2,4-Trimethylbenzene
TBT	Tetrabutyl titanate	TML	Tetramethyl lead
TBZ	1,2,3-Trichlorobenzene	TMP	1-Isobutyrate
TCA	2,4,5-Trichlorophenoxyacetic acid	TNA	Tannic acid
		TNI	Thallium nitrate
		TNM	Tetranitromethane

TOD	p-Toluidine	VTS	Vinyltrichlorosilane
TOF	Tall oil, fatty acid	WCA	Waxes: carnauba
TOI	m-Toluidine	WPF	Waxes: paraffin
TOL	Toluene	WSL	White spirit (low (15-20%) aromatic)
TPA	2-(2,4,5-Trichlorophenoxy) propanoic acid	XLM	m-Xylene
TPE	Isooctyl ester	XLO	o-Xylene
TPG	Thiophosgene	XLP	p-Xylene
TPH	Trichlorophenol	XYL	Xylenol
TPI	Triethyl phosphite	ZAC	Zinc ammonium chloride
TPO	Tris(Aziridinyl)phosphine oxide	ZAR	Zinc arsenate
TPP	Trimethyl phosphite	ZBC	Zinc bichromate
TPS	Triethyl phosphate	ZBO	Zinc borate
TPT	Turpentine	ZBR	Zinc bromide
TRB	Tridecylbenzene	ZCA	Zirconium acetate
TRC	Trichlorfon	ZCB	Zinc carbonate
TRD	Tridecane	ZCL	Zinc chloride
TRL	Tripropylamine	ZCN	Zinc cyanide
TRN	Thorium nitrate	ZCO	Zirconium oxychloride
TRP	Trixylenyl phosphate	ZCR	Zinc chromate
TSU	Thallium sulfate	ZCS	Zirconium sulfate
TTB	1,2,3,5-Tetramethylbenzene	ZCT	Zirconium tetrachloride
TTD	1-Tetradecene	ZDP	Zinc dialkyldithiophosphate
TTE	Tetrachloroethylene	ZEC	Zectran
TTF	1,1,2-Trichloro-1,2,2-trifluoroethane	ZFB	Zinc fluoroborate
TTG	Tetraethylene glycol	ZFM	Zinc formate
TTN	Tetradecanol	ZFX	Zinc fluoride
TTP	Tetraethylenepentamine	ZHS	Zinc hydrosulfite
TTT	Titanium tetrachloride	ZIR	Zirconium nitrate
TXP	Toxaphene	ZNA	Zinc acetate
UAN	Uranyl nitrate	ZNT	Zinc nitrate
UAS	Urea, ammonium nitrate soln (w/aqua ammonia)	ZPC	Zinc potassium chromate
UDA	Undecanoic acid	ZPF	Zirconium potassium flouride
UDB	n-Undecylbenzene	ZPP	Zinc phosphide
UDC	1-Undecene	ZPS	Zinc phenolsulfonate
UND	Undecanol	ZSF	Zinc sulfate
UPO	Urea peroxide	ZSL	Zinc silicofluoride
URA	Uranyl acetate		
URE	Urea		
URP	Uranium peroxide		
URS	Uranyl sulfate		
VAL	Valeraldehyde		
VAM	Vinyl acetate		
VBL	Vanillan black liquor		
VCH	Vinylcyclohexene		
VCI	Vinylidene chloride		
VCM	Vinyl chloride		
VEE	Vinyl ethyl ether		
VFI	Vinyl fluoride		
VME	Vinyl methyl ether		
VND	Vinyl neodecanoate		
VNO	Vanadium oxide		
VNT	Vinyl toluene		
VOT	Vanadium oxytrichloride		
VOX	Vanadium pentoxide		
VSF	Vanadyl sulfate		

## 10. DATA SOURCES

The source of every item of data contained in section 11 is recorded in master data files and is available on request. The principal sources are listed below. Many other sources were consulted, but most of them provided only a few items and are not given here. In a few cases the information given is based on an analogy with that for a closely related chemical; the analogy was drawn by an expert in the field, whose identity appears in the master data files.

Where a source was used for a single category of data, the source is given in Section 3 ("Explanation of Terms") and is not repeated here.

### 10.1 GENERAL SOURCES

The following sources contained data for many of the 13 data categories used:

1. Manufacturers' Technical Bulletins - This is usually the best single source of general information about the chemical. The bulletins contain the most recent data. Bulletins were not available for a few chemicals that are not items of commerce but are intermediates shipped from one manufacturing site to another.
2. Material Safety Data Sheets - These were provided by the manufacturer using the U.S. Department of Labor Form OSHA-20 or an approved modification.
3. Code of Federal Regulations - Office of the Federal Register, Archives and Record Service, Washington, D.C., 1972. Titles 46 (Shipping) and 49 (Transportation) were used in the most recent revision available, October 1, 1996.
4. Chemical Safety Data Sheets - Chemical Manufacturers Association, Washington, D.C.
5. Industrial Safety Sheets - National Safety Council, Chicago, Illinois.
6. International Maritime Dangerous Goods Code - International Maritime Organization (IMO), London, January 1, 1990.
7. Petroleum Products Handbook - V.B. Guthrie (ed.), McGraw-Hill, New York, 1960.
8. Glossary of Terms Used in Petroleum Refining - 2nd edition, American Petroleum Institute, New York, 1962.
9. The Handling and Storage of Liquid Propellants - Office of Defense Research and Engineering, U.S. Government Printing Office, Washington, D. C., 1963.
10. Industrial Chemicals - W.L. Faith, D.B. Keyes, and R.L. Clark, 3rd edition, Wiley, New York, 1965.
11. Chemical Technology of Petroleum - W.A. Gruse and D.R. Stevens, 3rd edition, McGraw-Hill, New York, 1960.
12. Chemical Rocket/Propellant Hazards - CPIA Publication No. 194, Vol. III, 1970.
13. Organic Solvents - J.A. Riddick and W.B. Bunger, 3rd edition, Wiley-Interscience, New York, 1970.
14. Transport of Dangerous Goods - (4 vols) United Nations, New York, 1981.

15. Kirk-Othmer Encyclopedia of Chemical Technology - 1st edition (1947 - 1960) and 2nd edition (1963 - 1970), Interscience-Wiley, New York.
16. Matheson Gas Data Book - 5th edition, Matheson Gas Products, East Rutherford, New Jersey, 1971.
17. Explosive and Toxic Hazardous Material - J.H. Meidl, Glencoe Press, Beverly Hills, California, 1969.
18. Dangerous Properties of Industrial Materials, 7th edition, N.I. Sax, Van Nostrand Reinhold Company, New York, 1989.
19. Organic Phosphorus Compounds - G.M. Kosolapoff and L. Maier (6 Vols.), Wiley-Interscience, New York.
20. The Chemistry of Organo-Phosphorus Pesticides - C. Fest and K.J. Schmidt, Springer-Verlag, New York, 1973.

## **10.2 CHEMICAL DESIGNATIONS**

1. Commercial Organic Chemical Names - Compiled by the Synthetic Organic Chemical Manufacturers Association (SOCMA), Chemical Abstracts Service, Columbus, Ohio, 1965.
2. Chemical Synonyms and Trade Names - W. Gardner and E.I. Cooke, 7th edition, CRC Press, Cleveland, Ohio, 1971.
3. The Merck Index of Chemical and Drugs - 11th edition, Merck and Co., Rahway, New Jersey, 1989.

## **10.3 HEALTH HAZARDS**

1. Industrial Hygiene and Toxicology - F.A. Patty, 3rd edition, Vol. II, Interscience, New York, 1981.
2. Toxicity and Metabolism of Industrial Solvents - E. Browning, Elsevier, New York, 1965.
3. Practical Toxicology of Plastics - R. Lefaux, CRC Press, Cleveland, Ohio, 1968.
4. Industrial Toxicology - L.T. Fairhall, Williams and Wilkins, 2nd edition, Baltimore, Maryland, 1957.
5. Toxicology of Drugs Chemicals - W.B. Deichman and H.W. Girarde, Academic Press, New York, 1969.
6. Clinical Toxicology of Commercial Products - M.N. Gleason, et al., 4th edition, Williams and Wilkins, Baltimore, Maryland, 1981.
7. Handbook of Toxicology: Acute Toxicities of Solids, Liquids and Gases to Laboratory Animals - W.S. Spector, Saunders, Philadelphia, Pa., 1956.
8. Occupational Diseases: A Guide to their Recognition - U.S. Department of Health, Education, and Welfare. Public Health Service Publication No. 1097. Superintendent of Documents, Washington, D.C., 1964.



9. First Aid Textbook - American National Red Cross, Washington, D.C., 1972.
10. Electrical Safety Practice: Odor Warning for Safety - Monograph 113 Instrument Society of America (ISA), Pittsburgh, Pa., 1972.
11. Toxic Substances - Annual List 1971 - H.E. Christensen, U.S. Department of Health, Education, and Welfare, Superintendent of Documents, Washington, D.C., 1971.
12. Hygienic Guide Series - American Industrial Hygiene Association, Detroit, Michigan, 48227.
13. Toxicity of Industrial Metals - E. Browning, 2nd Edition, Appleton-Century-Crofts, New York, 1969.

#### **10.4 FIRE HAZARDS**

1. The Fire and Explosion Hazards of Commercial Oils - W. Vlachos and C.A. Vlachos, Vlachos and Co., Philadelphia, Pa., 1921.
2. 1972 Annual Book of ASTM Standards - American Society for Testing and Materials, Philadelphia, Pa., 1972.
3. Fire Protection Guide on Hazardous Materials - 10th edition, Nos. 325A, 325M, 49, 491M, and 704M, National Fire Protection Association (NFPA), Boston, Mass., 1991.
4. Fire Protection Handbook - A. E. Cote (ed.), 17th edition, National Fire Protection Association (NFPA), Boston, Mass., 1991.
5. Handbook of Industrial Loss Prevention - 2nd edition, Factory Mutual Engineering Corp., McGraw-Hill, New York, 1967.

#### **10.5 WATER POLLUTION**

1. Water Quality Criteria Data Book - Vol. 1 - Organic Chemicals (1970) and Vol. 2 - Inorganic Chemicals (1971), United States Environmental Protection Administration, Superintendent of Documents, Washington, D.C.
2. Engineering Management of Water Quality - P.H. McGauhey, McGraw-Hill, New York, 1968.
3. The BOD of Textile Chemicals - Proceedings of the American Association of Textile Chemists and Colorists, American Dyestuff Reporter, August 29, 1966, p. 39.
4. Biodegradable Surfactants for the Textile Industry - American Dyestuff Reporter, January 30, 1967.
5. Water Quality Criteria - J.E. McKee and M.W. Wolf, 2nd edition, California State Water Quality Control Board, Sacramento, California, 1963.
6. Water Quality Criteria - National Technical Advisory Committee, Federal Water Pollution Control Administration, Washington, D.C. 1968.
7. Water Quality Characteristics of Hazardous Materials - R.W. Hann, Jr., and P.A. Jensen, Environmental Engineering Division, Texas A and M University, College Station, Texas, 1974.

## 10.6 PHYSICAL AND CHEMICAL PROPERTIES

1. Solubilities of Inorganic and Organic Compounds - H. Stephen and T. Stephen, Macmillan, New York, 1963, Vol. 1, Part 1.
2. The Critical Constants of Organic Compounds - A.P. Kudchadker, G.H. Alani and B.J. Zwolinski, Chemical Reviews, 68,659 (1968).
3. Physical Properties of Hydrocarbons - Vol. 1 (1968) and Vol. 2 (1970), R.W. Gallant, Gulf Publishing Co., Houston, Texas.
4. International Critical Tables - McGraw-Hill, New York, 1926.
5. Handbook of Chemistry and Physics - R.C. Weast (ed.), 62nd edition, CRC Publishing Co., Cleveland, Ohio, 1982.
6. The Properties of Gases and Liquids - R.C. Reid and T.K. Sherwood, 2nd edition, McGraw-Hill, New York, 1966.
7. Thermal Conductivity of Gases and Liquids - N.V. Tsederburg, MIT Press, Cambridge, Mass., 1965.
8. Lange's Handbook of Chemistry - N.A. Lange, 12th edition, McGraw-Hill, New York, 1979.
9. The Chemical Thermodynamics of Organic Compounds - D.R. Stull, et al., Wiley, New York, 1969.
10. Matheson Gas Data Book - 4th edition, Matheson Co., Inc., 1966.
11. Physical Properties of Chemical Compounds - Vol. 1 (1955), Vol. 2 (1959), and Vol. 3 (1961), R.R. Dreisbach, American Chemical Society, Washington, D.C.
12. Beilsteins Handbuch der Organischen Chemie - Springer, Berlin, Germany.
13. Gmelins Handbuch der Anorganischen Chemie - Verlag Chemie, Weinheim, Germany.
14. Solubilities of Inorganic and Organic Compounds - 3rd edition and supplement, A. Seidell and W.F. Linke, Van Nostrand, New York, 1941 - 1952.
15. Selected Values of Physical and Thermodynamics Properties of Hydrocarbons and Related Compounds - F.D. Rossini, et.al., American Petroleum Institute Project 44, American Petroleum Institute, Pittsburgh, Pa., 1953.
16. Heat of Combustion and Formation of Organic Compounds - E.S. Domalski, Journal of Physical and Chemical Reference Data, 1,221 (1972).
17. Surface Tension of Pure Liquid Compounds - J.L. Jasper, J. Phys. Chem. Ref. Data, 1,841 (1972).
18. JANAF Thermochemical Tables - NSRDS - NBS - 37 (1970); 1974 Supplement and complete index, J. Phys. Chem. Ref. Data, 3,311 (1974).

19. Physical and Thermodynamic Properties of Aliphatic Alcohols - R.C. Wilhoit and B.J. Zwolinski, J. Phys. Chem. Ref. Data, 2 (1973), Supplement 1.
20. Critical Constants of Hydrocarbons - C.A. Passut and R.P. Danner, Ind. Eng. Chem., Pro. Des. Devel., 12,365 (1973).

# ACETIC ACID

AAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethanoic acid Glacial acetic acid Vinegar acid	Watery liquid  Colorless  Strong vinegar odor  Sinks and mixes with water. Irritating vapor is produced. Freezing point is 62°F.
<b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to nose and throat. If inhaled, will cause coughing, nausea, vomiting, or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 4; Organic acid
- 2.2 Formula: CH<sub>3</sub>COOH
- 2.3 IMO/UN Designation: 3.3/1842
- 2.4 DOT ID No.: 2789
- 2.5 CAS Registry No.: 64-19-7
- 2.6 NAERG Guide No.: 132
- 2.7 Standard Industrial Trade Classification: 51371

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective clothing should be worn when skin contact might occur. Respiratory protection necessary when exposed to vapor. Complete eye protection.
- 3.2 **Symptoms Following Exposure:** Breathing of vapors causes coughing, chest pain, and irritation of nose and throat; may cause nausea and vomiting. Contact with skin and eye causes burns.
- 3.3 **Treatment of Exposure:** INHALATION: move victim at once to fresh air; if breathing becomes difficult, give oxygen; get medical care quickly. INGESTION: if victim is conscious, have him drink water or milk; do NOT induce vomiting. Get medical care immediately. SKIN OR EYE CONTACT: flush immediately with plenty of clean running water; wash eyes for at least 15 min. and get medical care as quickly as possible; remove contaminated clothing and launder before wearing again.
- 3.4 **TLV-TWA:** 10 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 15 ppm
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5.0 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes of contact.
- 3.12 **Odor Threshold:** 1.0 ppm
- 3.13 **IDLH Value:** 50 ppm
- 3.14 **OSHA PEL-TWA:** 10 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 112°F O.C. 103°F C.C.
- 4.2 **Flammable Limits in Air:** 4.0%-19.9%
- 4.3 **Fire Extinguishing Agents:** Water, alcohol foam, dry chemical or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** None
- 4.5 **Special Hazards of Combustion Products:** Irritating vapor generated when heated.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 961°F
- 4.8 **Electrical Hazards:** I,D
- 4.9 **Burning Rate:** 1.6 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Corrosive, particularly when diluted. Attacks most common metals, including most stainless steels. Excellent solvent for many synthetic resins or rubber.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water, rinse with sodium bicarbonate solution.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
75 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water  
100 ppm/96 hr/goldfish/TL<sub>50</sub>/fresh water  
100-330 ppm/48 hr/shrimp/LC<sub>50</sub>/aerated water
- 6.2 **Waterfowl Toxicity:** Not pertinent
- 6.3 **Biological Oxygen Demand (BOD):** 52-62%. 5 days
- 6.4 **Food Chain Concentration Potential:** None noted
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; USP; CP
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 5000
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 60.05
- 9.3 **Boiling Point at 1 atm:** 244°F = 117.9°C = 391.1°K
- 9.4 **Freezing Point:** 62.1°F = 16.7°C = 290°K
- 9.5 **Critical Temperature:** 610.9°F = 321.6°C = 594.8°K
- 9.6 **Critical Pressure:** 839 psia = 57.1 atm = 5.78 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.051 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 2.1
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.145
- 9.12 **Latent Heat of Vaporization:** 17.1 Btu/lb = 96.7 cal/g = 4.05 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -5645 Btu/lb = -3136 cal/g = -131.3 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 45.91 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.60 psia

### NOTES

# ACETIC ACID

AAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
70	65.469	70	0.487	65	1.100		N O T
80	65.089	80	0.492	70	1.097		
90	64.709	90	0.497	75	1.093		
100	64.320	100	0.502	80	1.090		P E R T I N E N T
110	63.940	110	0.507	85	1.087		
120	63.561	120	0.512	90	1.083		
130	63.180	130	0.517	95	1.080		
140	62.800	140	0.523	100	1.077		
150	62.420	150	0.528	105	1.074		
160	62.040	160	0.533	110	1.070		
170	61.660	170	0.538	115	1.067		
180	61.270	180	0.543	120	1.064		
190	60.890	190	0.548	125	1.060		
200	60.511	200	0.553	130	1.057		
210	60.130	210	0.558	135	1.054		
		220	0.563	140	1.050		
		230	0.568	145	1.047		
		240	0.573	150	1.044		
				155	1.041		
				160	1.037		
				165	1.034		
				170	1.031		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		70	0.234	70	0.00247	0	0.236
		80	0.324	80	0.00336	25	0.245
		90	0.443	90	0.00451	50	0.255
		100	0.597	100	0.00597	75	0.264
		110	0.795	110	0.00780	100	0.273
		120	1.045	120	0.01008	125	0.282
		130	1.359	130	0.01289	150	0.290
		140	1.748	140	0.01631	175	0.299
		150	2.227	150	0.02043	200	0.307
		160	2.810	160	0.02537	225	0.315
		170	3.516	170	0.03123	250	0.323
		180	4.362	180	0.03814	275	0.330
		190	5.369	190	0.04623	300	0.338
		200	6.559	200	0.05562	325	0.345
		210	7.958	210	0.06647	350	0.352
		220	9.590	220	0.07893	375	0.359
		230	11.480	230	0.09315	400	0.366
		240	13.670	240	0.10930	425	0.372
		250	16.180	250	0.12750	450	0.379
		260	19.040	260	0.14800	475	0.385
		270	22.300	270	0.17090	500	0.391
		280	25.980	280	0.19650	525	0.398
		290	30.130	290	0.22480	550	0.403
		300	34.790	300	0.25620	575	0.409
						600	0.415

# ACETALDEHYDE

AAD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic aldehyde Ethanal Ethyl aldehyde	Watery liquid  Floats and mixes with water. Boiling point is 69°F.	Colorless	Sharp, fruity odor
Avoid contact with liquid and vapor. Keep people away. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.			
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Combat fires from safe distance or protected location. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 19; Aldehyde
- 2.2 Formula: CH<sub>3</sub>CHO
- 2.3 IMO/UN Designation: 3.1/1089
- 2.4 DOT ID No.: 1089
- 2.5 CAS Registry No.: 75-07-0
- 2.6 NAERG Guide No.: 129
- 2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, eye goggles, and other equipment to prevent any contact with body. Organic canister or air pack as required.
- 3.2 **Symptoms Following Exposure:** Breathing vapors will be irritating and may cause nausea, vomiting, headache, and unconsciousness. Contact with eyes may cause burns and eye damage. Skin contact from clothing wet with the chemical causes burns or severe irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if breathing has stopped, give artificial respiration; if breathing is difficult, give oxygen; call a physician at once. SKIN: wash with soap and water. EYES: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: 25 ppm
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 0.05
- 3.13 **IDLH Value:** 2,000 ppm
- 3.14 **OSHA PEL-TWA:** 200 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -36°F C.C.; -58°F O.C.
- 4.2 **Flammable Limits in Air:** 4%-60%
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide, or water fog.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water and foam may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Produces irritating vapor when heated
- 4.6 **Behavior in Fire:** Vapors are heavier than air and may travel a considerable distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 365°F, 300°F, 347 °F
- 4.8 **Electrical Hazards:** Class I, Group C
- 4.9 **Burning Rate:** 3.3 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 7.800 (Est.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** May occur. Avoid heat, dust, strong oxidizing or reducing substances, strong acids and bases
- 5.6 **Inhibitor of Polymerization:** None

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 124-140 ppm/48 hr/golden orfe/LC50  
53 ppm/96 hr/bluegill sunfish/LC50/  
53 ppm/96 hr/sunfish/TL<sub>m</sub>/fresh water  
70 ppm/24 hr/pin perch/TL<sub>m</sub>/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 93-127%, 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 2  
Human Oral hazard: I  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** >99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Inerted
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid
- 8.2 49 CFR Class: 3
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
 

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	4
Instability (Yellow).....	2
- 8.6 EPA Reportable Quantity: 1000
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: U001
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 44.05
- 9.3 **Boiling Point at 1 atm:** 68.7°F = 20.4°C = 293.6°K
- 9.4 **Freezing Point:** -189°F = -123°C = 150°K
- 9.5 **Critical Temperature:** 370.4°F = 188°C = 461.2°K
- 9.6 **Critical Pressure:** 820 psia = 56 atm = 5.7 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.780 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 1.5
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.182
- 9.12 **Latent Heat of Vaporization:** 245 Btu/lb = 136 cal/g = 5.69 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -10,600 Btu/lb = -5890 cal/g = -246.4 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 25.6 psia

### NOTES

# ACETALDEHYDE

AAD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-20	52.490	-100	0.297	28	1.317		N O T  P E R T I N E N T
-10	52.060	-80	0.300	30	1.314		
0	51.630	-60	0.304	32	1.311		
10	51.200	-40	0.308	34	1.307		
20	50.770	-20	0.311	36	1.304		
30	50.340	0	0.315	38	1.301		
40	49.910	20	0.319	40	1.297		
50	49.480	40	0.322	42	1.294		
60	49.050	60	0.326	44	1.291		
				46	1.287		
				48	1.284		
				50	1.281		
				52	1.277		
				54	1.274		
				56	1.271		
				58	1.267		
				60	1.264		
				62	1.261		
				64	1.258		
				66	1.254		
				68	1.251		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	0	2.704	0	0.02414	0	0.269
		5	3.111	5	0.02747	20	0.276
		10	3.567	10	0.03117	40	0.283
		15	4.080	15	0.03527	60	0.290
		20	4.652	20	0.03980	80	0.298
		25	5.291	25	0.04480	100	0.305
		30	6.002	30	0.05029	120	0.312
		35	6.790	35	0.05633	140	0.319
		40	7.664	40	0.06294	160	0.326
		45	8.629	45	0.07016	180	0.333
		50	9.693	50	0.07804	200	0.339
		55	10.860	55	0.08661	220	0.346
		60	12.150	60	0.09593	240	0.353
		65	13.560	65	0.10600	260	0.360
		70	15.100	70	0.11700	280	0.366
		75	16.780	75	0.12880	300	0.373
		80	18.610	80	0.14150	320	0.379
		85	20.610	85	0.15520	340	0.386
		90	22.770	90	0.17000	360	0.392
		95	25.120	95	0.18590	380	0.398
		100	27.660	100	0.20280	400	0.405
		105	30.400	105	0.22090	420	0.411
		110	33.360	110	0.24030	440	0.417
		115	36.560	115	0.26100		
		120	39.990	120	0.28310		
		125	43.680	125	0.30660		

# ACRYLAMIDE SOLUTION

AAM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acrylic acid amide (50%) Acrylic amide 50% Propenamide (50%)	Liquid  Colorless  Odorless   Sinks and mixes with water.
<b>AVOID CONTACT WITH LIQUID. KEEP PEOPLE AWAY.</b> Avoid inhalation. Wear rubber overclothing (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $\text{CH}_2=\text{CHCOONH}_2\cdot\text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2074  
2.5 CAS Registry No.: 79-06-1  
2.6 NAERG Guide No.: 153P  
2.7 Standard Industrial Trade Classification: 51471

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses with side shields; clean body-covering clothing; rubber gloves, boots, apron as dictated by circumstances; in absence of proper environmental control, use approved dust respirator.
- 3.2 **Symptoms Following Exposure:** Has produced central nervous system damage, which is partly reversible. Effects can be produced by oral or skin contact. Chronic acrylamide poisoning can cause midbrain disturbance and peripheral neuropathy. Contact with liquid can cause moderate irritation of eyes and skin and may cause moderate transient corneal injury.
- 3.3 **Treatment of Exposure:** INHALATION: if ill effects occur, immediately get patient to fresh air, keep him quiet and warm, and get medical help. INGESTION: if ingested, immediately give large amounts of water (or milk if immediately available), then induce vomiting and get medical help. EYES: immediately flush with plenty of water for at least 15 min. and get medical help promptly. SKIN: immediate, continuous, and thorough washing in flowing water is imperative, preferably deluge shower with abundant soap; if burns are present, get medical help; discard all contaminated clothing and wearing accessories.
- 3.4 TLV-TWA: 0.3 mg/m<sup>3</sup>  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3; oral rat LD<sub>50</sub> = 170 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Repeated exposure to small amounts may cause essentially reversible neurological effects  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Not pertinent  
3.13 IDLH Value: 60 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 0.03 mg/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, CO<sub>2</sub>, water spray.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available.
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.
- 4.6 **Behavior in Fire:** Sealed containers may burst as a result of polymerization.
- 4.7 **Auto Ignition Temperature:** 464°F
- 4.8 **Electrical Hazards:** II, G
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** May occur at temperatures above 50°C (120°F).
- 5.6 **Inhibitor of Polymerization:** Oxygen (air) plus 50 ppm of copper as copper sulfate

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
130 ppm/96 hr/ harlequin fish/LC<sub>50</sub>
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 15%-50% solution in water
- 7.2 **Storage Temperature:** Below 50°C (122°F)
- 7.3 **Inert Atmosphere:** Ventilated (natural)
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 2              |
- 8.6 EPA Reportable Quantity: 5000
- 8.7 EPA Pollution Category: D
- 8.8 RCRA Waste Number: U007
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 71 (solute only)
- 9.3 Boiling Point at 1 atm: Currently not available (Vapor Pressure = 0.033 atm at 125°C)
- 9.4 Freezing Point: 183°F = 84°C = 357°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.05 at 25°C (liquid)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Currently not available
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES



# ACRYLAMIDE SOLUTION

AAM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	216.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# N-AMYL ALCOHOL

AAN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Amyl alcohol n-Butylcarbinol 1-Pentanol Pentyl alcohol	Liquid  Colorless  Mild, sweet odor  Floats on water. Flammable, irritating vapor is produced.
<b>Shut off ignition sources and call fire department. Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor; avoid inhalation. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	<b>FLAMMABLE:</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause coughing, nausea, headache, or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to eyes. Harmful if swallowed. Not irritating to skin. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 20; Alcohols, glycols  
2.2 **Formula:**  $\text{CH}_3(\text{CH}_2)_4\text{CH}_2\text{OH}$   
2.3 **IMO/UN Designation:** 3.2/1105  
2.4 **DOT ID No.:** 1105  
2.5 **CAS Registry No.:** 71-41-0  
2.6 **NAERG Guide No.:** 129  
2.7 **Standard Industrial Trade Classification:** 51229

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Face splash shield, goggles, protective clothing, and cartridge respirator.  
3.2 **Symptoms Following Exposure:** Irritation of skin, eyes, and respiratory tract; headache and vertigo; dyspnea and cough; nausea, vomiting, and diarrhea. Double vision, deafness, delirium, and occasionally fatal poisoning, preceded by severe nervous symptoms, have been reported. Coma, glycosuria, and methemoglobinemia can occur.  
3.3 **Treatment of Exposure:** SKIN: remove chemical by thorough washing with soap and water. EYES: wash promptly with large quantities of water for at least 15 mins. Call a doctor.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to  $5$  g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** 0.12 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 91°F C.C.  
4.2 **Flammable Limits in Air:** 1.1%-10%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 680°F  
4.8 **Electrical Hazards:** Not listed  
4.9 **Burning Rate:** 3.6 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 155%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1/BOD  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%; 74% plus 25% 2-methyl-1-butanol  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed  
8.7 **EPA Pollution Category:** Not listed  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 88.15  
9.3 **Boiling Point at 1 atm:** 280.2°F = 137.9°C = 411.1°K  
9.4 **Freezing Point:** -110°F = -79°C = 194°K  
9.5 **Critical Temperature:** 595.4°F = 313°C = 586.2°K  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.818 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** 25.60 dynes/cm = .02560 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 5 dynes/cm = 0.005 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.06  
9.12 **Latent Heat of Vaporization:** 217.1 Btu/lb = 120.6 cal/g =  $5.049 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -16,200 Btu/lb = -9000 cal/g =  $-376.8 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.2 psia

### NOTES

# N-AMYL ALCOHOL

AAN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	51.840	20	0.465	30	1.062	55	7.037
40	51.690	30	0.477	35	1.058	60	6.275
45	51.530	40	0.490	40	1.055	65	5.608
50	51.370	50	0.502	45	1.051	70	5.022
55	51.220	60	0.514	50	1.047	75	4.507
60	51.060	70	0.526	55	1.043	80	4.053
65	50.910	80	0.539	60	1.039	85	3.651
70	50.750	90	0.551	65	1.035	90	3.296
75	50.590	100	0.563	70	1.031	95	2.981
80	50.440	110	0.575	75	1.027	100	2.701
85	50.280	120	0.587	80	1.023	105	2.451
90	50.130	130	0.600	85	1.019	110	2.228
95	49.970	140	0.612	90	1.015	115	2.029
100	49.810	150	0.624	95	1.011	120	1.851
105	49.660	160	0.636	100	1.007		
110	49.500	170	0.649	105	1.003		
115	49.340			110	0.999		
120	49.190			115	0.995		
				120	0.991		
				125	0.987		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
78	2.600	20	0.007	20	0.00012	0	0.366
		30	0.011	30	0.00018	10	0.371
		40	0.017	40	0.00028	20	0.375
		50	0.026	50	0.00042	30	0.380
		60	0.039	60	0.00062	40	0.384
		70	0.059	70	0.00091	50	0.388
		80	0.087	80	0.00132	60	0.393
		90	0.125	90	0.00187	70	0.397
		100	0.180	100	0.00264	80	0.402
		110	0.254	110	0.00366	90	0.406
		120	0.354	120	0.00502	100	0.411
		130	0.489	130	0.00681	110	0.415
		140	0.668	140	0.00915	120	0.420
		150	0.903	150	0.01217	130	0.424
		160	1.209	160	0.01603	140	0.428
		170	1.604	170	0.02092	150	0.433
						160	0.437
						170	0.442
						180	0.446
						190	0.451
						200	0.455
						210	0.459
						220	0.464
						230	0.468
						240	0.473
						250	0.477

# SEC-AMYL ACETATE

AAS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Banana oil Pear oil 2-Pentylacetate	Watery liquid      Colorless to yellow      Banana odor  Floats on water. Flammable, irritating vapor is produced.
Shut off ignition sources and call fire department. Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor; avoid inhalation. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause nausea, headache or dizziness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	<b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 34; Ester  
 2.2 **Formula:** CH<sub>3</sub>COOCH(CH<sub>3</sub>)CH<sub>2</sub>C<sub>4</sub>H<sub>9</sub>  
 2.3 **IMO/UN Designation:** 3.3/1104  
 2.4 **DOT ID No.:** 1104  
 2.5 **CAS Registry No.:** 626-38-0  
 2.6 **NAERG Guide No.:** 129  
 2.7 **Standard Industrial Trade Classification:** 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, chemical goggles or face shield, and lab coat.  
 Organic vapor chemical cartridge respirator for less than 1000 ppm; self-contained breathing apparatus for greater than 1000 ppm.
- 3.2 **Symptoms Following Exposure:** INHALATION AND INGESTION: Irritates the mucous membrane, depresses the central nervous system, and is a narcotic. Damage to kidney, liver, and lung can occur. Ingestion may irritate gastro-intestinal tract. EYES: Irritation. Skin: Irritation.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove from exposure, administer oxygen if needed. EYES: Flush with water for at least 15 min. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. Subsequent treatment is symptomatic and supportive in nature.
- 3.4 **TLV-TWA:** 125 ppm.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available.  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** 0.08 ppm  
 3.13 **IDLH Value:** 1,000 ppm  
 3.14 **OSHA PEL-TWA:** 125 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 89°F C.C.  
 4.2 **Flammable Limits in Air:** 1.00%-7.50%  
 4.3 **Fire Extinguishing Agents:** Water fog in conjunction with alcohol foam, dry chemical or carbon dioxide.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
 4.5 **Special Hazards of Combustion Products:** When heated emits acrid fumes.  
 4.6 **Behavior in Fire:** When exposed to flames can react vigorously with oxidizing material.  
 4.7 **Auto Ignition Temperature:** 680°F-714°F.  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** Not pertinent  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 65 ppm/96 hr/Mosquito fish/TL<sub>m</sub>/turbid water (mixed isomers)  
 53 ppm/24 hr/brine shrimp/TL<sub>m</sub>  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** 53%, 5 days/70%, 15 days 62%, 10 days/80%, 20 days  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 2  
 Human Oral hazard: 1  
 Human Contact hazard: 1  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** Currently not available  
 7.4 **Venting:** Currently not available  
 7.5 **IMO Pollution Category:** C  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** III  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed  
 8.7 **EPA Pollution Category:** Not listed  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 130.18  
 9.3 **Boiling Point at 1 atm:** 271.4°F = 133°C = 406.2°K  
 9.4 **Freezing Point:** -95.44°F = -70.8°C = 202.4°K  
 9.5 **Critical Temperature:** 619.0°F = 326.1°C = 599.3°K  
 9.6 **Critical Pressure:** 411.6 psia = 28.0 atm = 2.83 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.861-0.866 at 20°C  
 9.8 **Liquid Surface Tension:** 28.9 dynes/cm = 0.0289 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** (est.) 44.1 dynes/cm = 0.0441 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** 4.5  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) > 1 - 1.1 at 20°C (68°F)  
 9.12 **Latent Heat of Vaporization:** (est.) 128.9 Btu/lb = 71.7 cal/g = 3.0 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -14,402 Btu/lb = -8000 cal/g = -334.9 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SEC-AMYL ACETATE

AAS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
625	18.647	68	0.702	68	7.188	619	0.028
650	17.026						
675	15.405						
700	13.784						
725	12.163						
750	10.542						
775	8.922						
800	7.301						
825	5.680						
850	4.059						
875	2.438						
900	0.817						
925	0.804						
950	0.000						
975	0.000						
1000	0.000						
1025	0.000						
1050	0.000						
1075	10.529						
1100	8.150						
1125	7.771						
1150	5.392						
1175	3.013						
1200	2.633						
1225	20.254						
1250	19.875						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
S L I G H T L Y  S O L U B L E		20	0.000	15	0.00062	68	34.580
		40	0.000	20	0.00072		
		60	0.719	25	0.00084		
		80	0.279	30	0.00098		
		100	1.277	35	0.00115		
		120	2.276	40	0.00134		
		140	3.274	45	0.00156		
		160	4.272	50	0.00183		
		180	5.270	55	0.00213		
		200	6.269	60	0.00249		
		220	7.267	65	0.00291		
		240	8.265	70	0.00340		
		260	9.264	75	0.00397		
				80	0.00464		
				85	0.00541		
				90	0.00632		
				95	0.00738		
				100	0.00862		
				105	0.01007		
				110	0.01176		
				115	0.01374		
				120	0.01605		

# AMMONIUM ACETATE

AAT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, ammonium salt	Solid  White  Weak ammonia odor  Sinks and mixes with water.
Stop discharge if possible. Keep people away. Avoid contact with solid and dust; avoid inhalation. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Irritating gases may be produced when heated. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{NH}_4(\text{C}_2\text{H}_3\text{O}_2)$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 631-61-8
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield (do not wear contact lenses); rubber gloves; impervious protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and mouth. Ingestion irritates mouth and stomach. Contact with dust causes irritation of eyes and mild irritation of skin.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; rinse nose and mouth with water. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: induce vomiting immediately. Give large amounts of water. EYES: flush with water for at least 15 min. SKIN: flush with soap and water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Use agents suitable for the surrounding fire.
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Irritating vapors of ammonia acetic acid, and nitrogen oxides may form in fires.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No requirement
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Will not polymerize.
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 238 ppm/24 hr/mosquito fish/TL<sub>m</sub>/fresh water
- 6.2 Waterfowl Toxicity: No reaction
- 6.3 Biological Oxygen Demand (BOD): 79%, 1-5 days
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent; CP; Technical, 97 + %
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 5000
- 8.7 EPA Pollution Category: D
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 77.08
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: 114°C (237°F)
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.17 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: -5.8 Btu/lb = -3.2 cal/g = -0.13 X 10<sup>5</sup> J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# AMMONIUM ACETATE

AAT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
39	148.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMMONIUM BICARBONATE

ABC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acid ammonium carbonate Ammonium hydrogen carbonate Carbonic acid, monoammonium salt	Solid  White  Weak ammonia odor  Sinks and mixes slowly with water. Freezing point is 95°F.
<b>Stop discharge if possible. Keep people away. Avoid contact with solid and dust; avoid inhalation. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Irritating gases may be produced when heated. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{NH}_4\text{HCO}_3$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 1066-33-7
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Work gloves; dust respirator; chemical safety goggles, protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation may cause respiratory irritation. Ingestion could be harmful. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** Consult physician in case of ingestion or severe irritation. INHALATION: move to uncontaminated atmosphere. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: if conscious, give water and induce vomiting. SKIN: Wash with large amounts of soap and water. EYES: wash with large amounts of water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Water fog, alcohol foam, dry chemical.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Irritating and toxic ammonia gas may form in fires.
- 4.6 **Behavior in Fire:** Decomposes, but reaction is not explosive. Ammonia gas is formed.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** May attack copper, nickel, and zinc
- 5.3 **Stability During Transport:** Decomposes above 34°C (91°F) with formation of ammonia gas, which may collect in closed containers
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Food; Reagent
- 7.2 **Storage Temperature:** Below 33°C (91°F)
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 5000
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 79.06
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes at 59°C)
- 9.4 **Freezing Point:** 95°F = 35°C = 308°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.57 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 140 Btu/lb = 80 cal/g = 3.3 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# AMMONIUM BICARBONATE

ABC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	7.432		N		N		N
36	8.265		O		O		O
38	9.099		T		T		T
40	9.932						
42	10.770		P		P		P
44	11.600		E		E		E
46	12.430		R		R		R
48	13.270		T		T		T
50	14.100		I		I		I
52	14.930		N		N		N
54	15.770		E		E		E
56	16.600		N		N		N
58	17.430		E		E		E
60	18.270		N		N		N
62	19.100		T		T		T
64	19.930						
66	20.770						
68	21.600						
70	22.430						
72	23.270						
74	24.100						
76	24.930						
78	25.770						
80	26.600						
82	27.430						
84	28.270						

# AMMONIUM BIFLUORIDE

ABF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acid ammonium fluoride Ammonium acid fluoride Ammonium hydrogen difluoride Ammonium hydrogen fluoride	Solid  White  Odorless   Sinks and mixes with water.
Avoid contact with solid and dust. Keep people away. Avoid inhalation. Wear rubber overclothing (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. If swallowed will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Chemical and Physical Treatment: Neutralize	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed 2.2 Formula: $\text{NH}_4\text{HF}_2$ 2.3 IMO/UN Designation: 8/1727 2.4 DOT ID No.: 1727 2.5 CAS Registry No.: 1341-49-7 2.6 NAERG Guide No.: 154 2.7 Standard Industrial Trade Classification: 51481
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> NIOSH approved respirator; rubber gloves; safety goggles; chemical resistant clothing. 3.2 <b>Symptoms Following Exposure:</b> Inhalation of dust may cause irritation of the respiratory system. Ingestion causes irritation of mouth and stomach, vomiting, abdominal pain, convulsions, collapse, acute toxic nephritis. Contact with dust irritates eyes and may cause chemical burns or rash on skin. High concs. of fluorine in the urine have been reported following skin contact. 3.3 <b>Treatment of Exposure:</b> Begin first aid as quickly as possible. INHALATION: remove victim to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. INGESTION: perform gastric lavage with lime water or 1% calcium chloride solution; support respiration; call a physician. EYES: flush with water for at least 15 min.; consult physician. SKIN: flush with water; treat burns. OTHER: remove all contaminated clothing in the shower at once. 3.4 <b>TLV-TWA:</b> 2.5 mg/m <sup>3</sup> as fluorines 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; LD <sub>50</sub> = 50 mg/kg (guinea pig), 60 mg/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> 2.5 mg/m <sup>3</sup> as fluorines 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Use agent suitable for surrounding fire.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not apply water to adjacent fires.
- 4.5 **Special Hazards of Combustion Products:** Toxic ammonia, hydrogen fluoride, hydrofluoric acid, and hydrogen gases may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves and forms a weak solution of hydrofluoric acid.
- 5.2 **Reactivity with Common Materials:** Reacts violently with bases. In presence of moisture will corrode glass, cement, and most metals. Flammable hydrogen gas may collect in enclosed spaces. Do not use steel, nickel, or aluminum containers.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
237 mg/l / 96 hr/ Zebra Barbel/Lco/
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: (3)  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure, 99+%; Technical, 97-98.5%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 2              |
- 8.6 **EPA Reportable Quantity:** 100
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 57.04
- 9.3 **Boiling Point at 1 atm:** 463.1°F = 239.5°C = 512.7°K (Decomposes at 446°F)
- 9.4 **Freezing Point:** 258.0°F = 125.6°C = 398.8°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.5 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 154 Btu/lb = 85.7 cal/g = 3.59 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# AMMONIUM BIFLUORIDE

ABF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	58.300		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ACETYL BROMIDE

ABM

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid

Colorless

Sharp unpleasant odor

Flammable, irritating vapor is produced.

**AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.**  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  
Avoid inhalation.  
Shut off ignition sources. Call fire department.  
Stop discharge if possible.  
Isolate and remove discharged material.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

#### FLAMMABLE:

Irritating gases are produced when heated.  
Flashback along vapor trail may occur.  
Vapor may explode if ignited in an enclosed area.  
Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).  
Extinguish with dry chemicals or carbon dioxide.  
DO NOT USE WATER ON FIRE.

### Exposure

#### CALL FOR MEDICAL AID.

#### VAPOR

Irritating to eyes, nose and throat.  
If inhaled will cause difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

#### LIQUID

Will burn skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $\text{CH}_3\text{COBr}$   
2.3 IMO/UN Designation: 8/1716  
2.4 DOT ID No.: 1716  
2.5 CAS Registry No.: 506-96-7  
2.6 NAERG Guide No.: 156  
2.7 Standard Industrial Trade Classification: 51372

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** NIOSH approved respirator; impervious protective clothing; chemical safety goggles; gloves; adequate ventilation; provisions for flushing eyes or skin with water
- 3.2 **Symptoms Following Exposure:** Inhalation produces primary irritation of the respiratory tract; symptoms of lung damage may be delayed. Contact with liquid produces primary irritation of eyes and severe skin damage; delayed blistering is not uncommon. INGESTION: Sore throat, abdominal pain, and vomiting.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; if breathing has stopped, give artificial respiration; if breathing is difficult, give oxygen; watch for delayed lung damage. EYES: flush with water for at least 15 min.; get medical attention. SKIN: flush with soap and water; treat burns as needed.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral rat  $\text{LD}_{50}$  = 3,310 mg/kg (acetic acid). Decomposes violently in water, forming bromic acid and acetic acid)
- 3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:**  $5.0 \times 10^{-4}$  ppm
- 3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Does not burn.
- 4.2 **Flammable Limits in Air:** Does not burn.
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen bromide fumes may form in fires.
- 4.6 **Behavior in Fire:** Do not apply water to adjacent fires. Reacts with water to produce toxic and irritating gases.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently, forming corrosive and toxic fumes of hydrogen bromide
- 5.2 **Reactivity with Common Materials:** Attacks and corrodes wood and most metals in the presence of moisture. Flammable hydrogen gas may collect in enclosed spaces. Reacts violently with water or alcohol.
- 5.3 **Stability During Transport:** Stable if protected from moisture. When exposed to air, can give off corrosive fumes.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with dilute sodium bicarbonate or soda ash solution.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: (2)  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Analytical; Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Padded
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 5000
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 122.95
- 9.3 **Boiling Point at 1 atm:**  $169^{\circ}\text{F} = 76^{\circ}\text{C} = 349^{\circ}\text{K}$
- 9.4 **Freezing Point:**  $-141.7^{\circ}\text{F} = -96.5^{\circ}\text{C} = 176.7^{\circ}\text{K}$
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.66 at 16°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 4.24
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.144
- 9.12 **Latent Heat of Vaporization:** 106 Btu/lb = 59 cal/g =  $2.5 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# ACETYL BROMIDE

ABM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	104.799	60	0.600	51	1.048	N O T  P E R T I N E N T	
36	104.700	61	0.600	52	1.048		
38	104.700	62	0.600	53	1.048		
40	104.599	63	0.600	54	1.048		
42	104.500	64	0.600	55	1.048		
44	104.500	65	0.600	56	1.048		
46	104.400	66	0.600	57	1.048		
48	104.299	67	0.600	58	1.048		
50	104.200	68	0.600	59	1.048		
52	104.200	69	0.600	60	1.048		
54	104.099	70	0.600	61	1.048		
56	104.000	71	0.600	62	1.048		
58	104.000	72	0.600	63	1.048		
60	103.900	73	0.600	64	1.048		
62	103.799	74	0.600	65	1.048		
64	103.799	75	0.600	66	1.048		
66	103.700	76	0.600	67	1.048		
68	103.599	77	0.600	68	1.048		
70	103.599			69	1.048		
72	103.500			70	1.048		
74	103.400			71	1.048		
76	103.299			72	1.048		
				73	1.048		
				74	1.048		
				75	1.048		
				76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
R E A C T I V E		55	1.445	55	0.03217	0	0.118
		60	1.634	60	0.03602	25	0.122
		65	1.844	65	0.04025	50	0.126
		70	2.076	70	0.04488	75	0.129
		75	2.331	75	0.04994	100	0.133
		80	2.612	80	0.05545	125	0.136
		85	2.922	85	0.06144	150	0.140
		90	3.261	90	0.06795	175	0.143
		95	3.632	95	0.07500	200	0.146
		100	4.038	100	0.08264	225	0.149
		105	4.481	105	0.09088	250	0.152
		110	4.963	110	0.09978	275	0.155
		115	5.487	115	0.10940	300	0.158
		120	6.056	120	0.11970	325	0.161
		125	6.673	125	0.13070	350	0.164
		130	7.341	130	0.14260	375	0.167
		135	8.062	135	0.15530	400	0.170
		140	8.841	140	0.16890	425	0.172
		145	9.680	145	0.18340	450	0.175
		150	10.580	150	0.19880	475	0.177
		155	11.550	155	0.21530	500	0.180
		160	12.600	160	0.23280	525	0.182
		165	13.710	165	0.25140	550	0.184
		170	14.910	170	0.27120	575	0.187
		175	16.180	175	0.29210	600	0.189

# ALKYL(C#M1#M1 - C#M1#M7)BENZENESULFONIC ACID

ABN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Decylbenzenesulfonic acid Un; do; tri; tetra; penta; or Hexa benzenesulfonic acid Un; do; tri; tetra; penta; or hexa decylbenzenesulfonic acid	Liquid	White to yellow	Odorless
Mixes with water.			
<p>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.</p>			
<b>Fire</b>	Combustible. Flammable gas may be produced on contact with metals. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $C_{10}H_{21}SO_3H$  (n = 11-17)  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed.  
2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Ingestion causes irritation of mouth and stomach. Contact with liquid irritates eyes and skin.  
3.3 **Treatment of Exposure:** INGESTION: give large amount of water. EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5-5$  g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 395°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Irritating sulfuric acid mist may form in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May attack metals, causing accumulation of flammable hydrogen gas in enclosed spaces.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute sodium bicarbonate or soda ash solution  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial, 88%-97%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed  
8.7 **EPA Pollution Category:** Not listed  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 310-394  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.0 to 1.4 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ALKYL(C#M1#M1 - C#M1#M7)BENZENESULFONIC ACID

ABN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	75.709		N O T		N O T	100	375.000
40	75.589						
45	75.469						
50	75.339						
55	75.219		P		P		
60	75.099		E		E		
65	74.980		R		R		
70	74.860		T		T		
75	74.740		I		I		
80	74.620		N		N		
85	74.490		E		E		
90	74.370		N		N		
95	74.250		T		T		
100	74.129						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T		N O T		N O T
			P		P		P
			E		E		E
			R		R		R
			T		T		T
			I		I		I
			N		N		N
			E		E		E
			N		N		N
			T		T		T

# ALLYL BROMIDE

ABR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bromallylene 3-Bromopropene 3-Bromopropylene	Liquid                      Colorless to light yellow                      Irritating odor  Sinks in water. Flammable, irritating vapor is produced
Shut off ignition sources. Call fire department. Evacuate area in case of large discharge. Avoid contact with liquid and vapor; avoid inhalation. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, coughing or difficult breathing. Move victim to fresh air. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> Not listed <b>2.2 Formula:</b> CH <sub>2</sub> = CHCH <sub>2</sub> Br <b>2.3 IMO/UN Designation:</b> 3.2/1099 <b>2.4 DOT ID No.:</b> 1099 <b>2.5 CAS Registry No.:</b> 106-95-6 <b>2.6 NAERG Guide No.:</b> 131 <b>2.7 Standard Industrial Trade Classification:</b> 51139
<b>3. HEALTH HAZARDS</b>  <b>3.1 Personal Protective Equipment:</b> Goggles and face shield; protective clothing; self-contained breathing apparatus for high vapor concentrations. <b>3.2 Symptoms Following Exposure:</b> Inhalation of vapor irritates mucous membranes and causes dizziness, headache, and lung irritation. Contact with liquid irritates eyes and skin. Ingestion causes irritation of mouth and stomach. <b>3.3 Treatment of Exposure:</b> INHALATION: remove from exposure; if not breathing, give artificial respiration; if breathing is difficult, give oxygen; call physician. EYES: flush with water for at least 15 min. and call physician. SKIN: flush with water; get medical attention for skin irritation. INGESTION: do NOT induce vomiting; get medical attention. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 4; oral LD <sub>50</sub> = 30 mg/kg (guinea pig) <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. <b>3.11 Liquid or Solid Characteristics:</b> Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 28°F C.C.  
**4.2 Flammable Limits in Air:** 4.4%-7.3%  
**4.3 Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
**4.5 Special Hazards of Combustion Products:** Toxic hydrogen bromide and bromine gases formed in fire.  
**4.6 Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
**4.7 Auto Ignition Temperature:** 563°F  
**4.8 Electrical Hazards:** I, D  
**4.9 Burning Rate:** 3.5 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Currently not available  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Currently not available  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Commercial  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** Not pertinent  
**7.4 Venting:** Pressure-vacuum  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid  
**8.2 49 CFR Class:** 3  
**8.3 49 CFR Package Group:** I  
**8.4 Marine Pollutant:** Yes  
**8.5 NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	1

**8.6 EPA Reportable Quantity:** Not listed  
**8.7 EPA Pollution Category:** Not listed  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** Avoid strong oxidizing materials, strong bases, and mineral acid chlorides.  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Will not polymerize.  
**5.6 Inhibitor of Polymerization:** Not pertinent

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 121  
**9.3 Boiling Point at 1 atm:** 158°F = 70°C = 343°K  
**9.4 Freezing Point:** -182°F = -119°C = 154°K  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 1.4161 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** 26.9 dynes/cm = 0.0269 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 20°C  
**9.10 Vapor (Gas) Specific Gravity:** 4.2  
**9.11 Ratio of Specific Heats of Vapor (Gas):** 1.1210  
**9.12 Latent Heat of Vaporization:** (est.) 110 Btu/lb = 59 cal/g = 2.5 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** (est.) 6,700 Btu/lb = 3,700 cal/g = 150 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES



# ALLYL BROMIDE

ABR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
65	89.570	34	0.340	32	0.749	30	0.627
70	89.230	36	0.340	34	0.749	35	0.607
75	88.900	38	0.340	36	0.749	40	0.587
80	88.570	40	0.340	38	0.749	45	0.569
85	88.240	42	0.340	40	0.749	50	0.552
90	87.910	44	0.340	42	0.749	55	0.535
95	87.589	46	0.340	44	0.749	60	0.519
100	87.270	48	0.340	46	0.749	65	0.504
105	86.950	50	0.340	48	0.749	70	0.490
110	86.639	52	0.340	50	0.749	75	0.476
115	86.330	54	0.340	52	0.749	80	0.463
120	86.020	56	0.340	54	0.749	85	0.451
125	85.709	58	0.340	56	0.749	90	0.439
130	85.410	60	0.340	58	0.749	95	0.428
		62	0.340	60	0.749		
		64	0.340	62	0.749		
		66	0.340	64	0.749		
		68	0.340	66	0.749		
		70	0.340	68	0.749		
		72	0.340	70	0.749		
		74	0.340	72	0.749		
		76	0.340	74	0.749		
		78	0.340	76	0.749		
		80	0.340	78	0.749		
		82	0.340	80	0.749		
		84	0.340	82	0.749		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	55	1.821	55	0.03988	100	0.158
	N	60	2.055	60	0.04457	120	0.162
	S	65	2.313	65	0.04970	140	0.166
	O	70	2.599	70	0.05530	160	0.169
	L	75	2.913	75	0.06141	180	0.173
	U	80	3.258	80	0.06805	200	0.177
	B	85	3.637	85	0.07526	220	0.180
	L	90	4.051	90	0.08308	240	0.183
	E	95	4.504	95	0.09153	260	0.187
		100	4.998	100	0.10070	280	0.190
		105	5.537	105	0.11050	300	0.194
		110	6.122	110	0.12110	320	0.197
		115	6.757	115	0.13250	340	0.200
		120	7.445	120	0.14480	360	0.203
		125	8.190	125	0.15790	380	0.206
		130	8.995	130	0.17190	400	0.209
		135	9.864	135	0.18700	420	0.212
		140	10.800	140	0.20300	440	0.215

# AMMONIUM BENZOATE

ABZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzoic acid, ammonium salt	Solid  White  Odorless  Sinks and mixes slowly with water.
<b>Stop discharge if possible. Keep people away. Avoid contact with solid and dust; avoid inhalation. Isolate and remove discharged material. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. Dust cloud may explode if ignited in an enclosed area. POISONOUS GASES MAY BE PRODUCED IN FIRE. Irritating gases may be produced when heated. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $C_6H_5COONH_4$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 1863-63-4
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses, gloves; NIOSH approved respirator in high concentrations.
- 3.2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose. Contact with eyes causes irritation. Ingestion leads to nausea and vomiting.
- 3.3 **Treatment of Exposure:** INHALATION: move to uncontaminated atmosphere. If breathing is difficult, give oxygen. EYES: flush with water for at least 15 min. SKIN: wash with soap and water. Ingestion: if conscious, induce vomiting.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Irritating and toxic ammonia gas and other nitrogen compounds or oxides of carbon may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:**  
Currently not available
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Avoid strong mineral acids and strong alkalis.
- 5.3 **Stability During Transport:** Slowly releases ammonia gas, which may collect in closed container.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 5000
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 139.15
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:**  $388^{\circ}F = 198^{\circ}C = 471^{\circ}K$
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.26 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 34 Btu/lb = 19 cal/g = 0.80 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# AMMONIUM BENZOATE

ABZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	15.440		N		N		N
36	15.790		O		O		O
38	16.130		T		T		T
40	16.480						
42	16.820		P		P		P
44	17.170		E		E		E
46	17.510		R		R		R
48	17.850		T		T		T
50	18.200		I		I		I
52	18.540		N		N		N
54	18.890		E		E		E
56	19.230		N		N		N
58	19.580		E		E		E
60	19.920		N		N		N
62	20.270		T		T		T
64	20.610						
66	20.950						
68	21.300						
70	21.640						
72	21.990						
74	22.330						
76	22.680						
78	23.020						
80	23.370						
82	23.710						
84	24.050						

# ACETIC ANHYDRIDE

ACA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetyl oxide Acetic acid anhydride Ethanoic anhydride	Watery liquid  Colorless  Strong vinegar odor  Sinks and reacts slowly with water. Irritating vapor is produced.
Avoid contact with liquid and vapor. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from safe distance or from behind barrier. Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Will burn eyes. Irritating to nose and throat. If inhaled, will cause nausea, vomiting, or difficult breathing. Move to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 11; Organic anhydride  
2.2 **Formula:** CH<sub>3</sub>CO O COCH<sub>3</sub>  
2.3 **IMO/UN Designation:** 8.0/1715  
2.4 **DOT ID No.:** 1715  
2.5 **CAS Registry No.:** 108-24-7  
2.6 **NAERG Guide No.:** 137  
2.7 **Standard Industrial Trade Classification:** 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective clothing when skin contact may occur; respiratory protection necessary for all exposures; complete eye protection.
- 3.2 **Symptoms Following Exposure:** Liquid is volatile and causes little irritation on uncovered skin. However, causes severe burns when clothing is wet with the chemical or if it enters gloves or shoes. Causes skin and eye burns and irritation of respiratory tract. Nausea and vomiting may develop after exposure.
- 3.3 **Treatment of Exposure:** INHALATION: move victim at once to fresh air; if not breathing, give artificial respiration; if breathing becomes difficult, give oxygen; get medical care quickly. INGESTION: do NOT induce vomiting. If conscious, give water or milk. SKIN OR EYE CONTACT WITH LIQUID OR VAPOR: flush immediately with plenty of clean running water; wash eyes for at least 15 min. and get medical care quickly.
- 3.4 **TLV-TWA:** 5 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Not pertinent  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant, may cause pain and second-degree burns after a few minutes of contact.  
3.12 **Odor Threshold:** 0.14 ppm; 0.49 mg/m<sup>3</sup>  
3.13 **IDLH Value:** 200 ppm  
3.14 **OSHA PEL-TWA:** 5 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 129°F O.C. 120°F C.C.  
4.2 **Flammable Limits in Air:** 2.7%-10.3%  
4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, alcohol foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use ordinary foam. Water and foam react, but heat liberated is not enough to create a hazard. Dry chemical forced below the surface can cause foaming and boiling.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.  
4.6 **Behavior in Fire:** Dangerous when exposed to heat or fire.  
4.7 **Auto Ignition Temperature:** 626°F  
4.8 **Electrical Hazards:** I,D  
4.9 **Burning Rate:** 3.3 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly with water; considerable heat liberated when water spray is used.  
5.2 **Reactivity with Common Materials:** Corrodes iron, steel, and other metals.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water; use sodium bicarbonate solution to rinse.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
265-279mg/L/48 hr/golden orfe/LC50  
55 mg/L/96 hr/daphnid/EC50  
75 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water  
100-300 ppm/48 hr/shrimp/LC<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Not pertinent  
6.3 **Biological Oxygen Demand (BOD):** 53%, 1-5 days  
6.4 **Food Chain Concentration Potential:** None noted  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities:

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure: 99% min. Technical: 75-98.5% min.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** 5000  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 102.09  
9.3 **Boiling Point at 1 atm:** 282°F = 139°C = 412°K  
9.4 **Freezing Point:** -101°F = -74.1°C = 199.1°K  
9.5 **Critical Temperature:** 564.8°F = 296°C = 569.2°K  
9.6 **Critical Pressure:** 679 psia = 46.2 atm = 4.68 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.08  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.52  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.093  
9.12 **Latent Heat of Vaporization:** 119 Btu/lb = 66.2 cal/g = 2.77 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -7058 Btu/lb = -3921 cal/g = -164.2 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.3 psia

### NOTES

# ACETIC ANHYDRIDE

ACA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-30	71.620	0	0.419	30	1.180		N O T  P E R T I N E N T
-20	71.200	10	0.421	35	1.176		
-10	70.790	20	0.424	40	1.171		
0	70.370	30	0.426	45	1.166		
10	69.959	40	0.429	50	1.161		
20	69.540	50	0.432	55	1.157		
30	69.120	60	0.434	60	1.152		
40	68.709	70	0.437	65	1.147		
50	68.290	80	0.439	70	1.143		
60	67.870	90	0.442	75	1.138		
70	67.459	100	0.445	80	1.133		
80	67.040	110	0.447	85	1.128		
90	66.629	120	0.450	90	1.124		
100	66.209	130	0.453	95	1.119		
110	65.790	140	0.455	100	1.114		
120	65.379	150	0.458	105	1.109		
130	64.959	160	0.460	110	1.105		
140	64.549	170	0.463	115	1.100		
150	64.129	180	0.466				
160	63.710	190	0.468				
170	63.300	200	0.471				
180	62.880	210	0.473				
190	62.460						
200	62.050						
210	61.630						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	70	0.082	70	0.00148	0	0.199
	E	80	0.119	80	0.00209	25	0.210
	A	90	0.168	90	0.00291	50	0.221
	C	100	0.235	100	0.00399	75	0.232
	T	110	0.323	110	0.00539	100	0.242
	S	120	0.437	120	0.00717	125	0.252
		130	0.584	130	0.00942	150	0.262
	S	140	0.770	140	0.01222	175	0.272
	L	150	1.004	150	0.01567	200	0.281
	O	160	1.295	160	0.01988	225	0.290
	W	170	1.654	170	0.02498	250	0.299
	L	180	2.090	180	0.03108	275	0.308
	Y	190	2.618	190	0.03833	300	0.316
		200	3.252	200	0.04688	325	0.325
		210	4.006	210	0.05688	350	0.333
		220	4.896	220	0.06851	375	0.340
		230	5.942	230	0.08194	400	0.348
		240	7.161	240	0.09734	425	0.356
		250	8.575	250	0.11490	450	0.363
		260	10.200	260	0.13480	475	0.370
		270	12.070	270	0.15730	500	0.377
		280	14.200	280	0.18260	525	0.384
		290	16.620	290	0.21080	550	0.390
		300	19.350	300	0.24220	575	0.396
		310	22.420	310	0.27700	600	0.403
		320	25.860	320	0.31550		

# AMMONIUM CARBONATE

ACB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hartshorn Sal volatile	Solid  White  Strong Ammonia Odor  Sinks and mixes with water.
Stop discharge if possible. Keep people away. Avoid contact with solid and dust; avoid inhalation. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $(\text{NH}_4)\text{HCO}_3 \cdot (\text{NH}_4)_2\text{CO}_3 \cdot \text{NH}_3$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 506-87-6
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52371

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust respirator; protection against ammonia vapors
- 3.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion may cause gastric irritation. Contact with eyes or skin causes irritation.
- 3.3 Treatment of Exposure: INHALATION: leave contaminated area. INGESTION: give large amount of water. EYES: flush with copious amounts of water. SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion:  $\text{LD}_{50} = 2.15 \text{ g/kg (rat)}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold:  $< 5 \text{ ppm (as ammonia gas)}$
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not pertinent
- 4.3 Fire Extinguishing Agents: Use agent suitable for surrounding fire.
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Toxic ammonia gas will form in fires.
- 4.6 Behavior in Fire: Decomposes, but reaction is not explosive. Ammonia gas is formed.
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Avoid contact with temperatures  $> 100^\circ\text{F}$ ; Sodium nitrite/nitrate
- 5.3 Stability During Transport: Unstable, decomposes to ammonia and  $\text{CO}_2$   $> 136^\circ\text{F}$
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 24 ppm/3.5 hr/goldfish/killed/fresh water  
10 ppm/ $>100 \text{ hr/goldfish/tolerated/fresh water}$
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: CP; NF; USP; Reagent; Technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	1
- 8.6 EPA Reportable Quantity: 5000
- 8.7 EPA Pollution Category: D
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at  $15^\circ\text{C}$  and 1 atm: Solid
- 9.2 Molecular Weight: 157.1
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.5 at  $20^\circ\text{C}$  (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: 2.7
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# AMMONIUM CARBONATE

ACB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	91.809		N O T		N O T		N O T
36	92.620						
38	93.429						
40	94.240						
42	95.049		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	95.860						
46	96.679						
48	97.490						
50	98.299						
52	99.110						
54	99.919						
56	100.700						
58	101.500						
60	102.400						
62	103.200						
64	104.000						
66	104.799						
68	105.599						
70	106.400						
72	107.200						
74	108.000						
76	108.799						
78	109.700						
80	110.500						
82	111.299						
84	112.099						

# ACETYL CHLORIDE

ACC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethanoyl chloride	Liquid                      Colorless                      Sharp odor  Reacts violently with water. Irritating visible vapor cloud is produced.
Shut off ignition sources. Call fire department. Avoid contact with liquid and vapor. Keep people away. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear chemical protective suit with self-contained breathing apparatus. Extinguish with dry chemicals or carbon dioxide. <b>DO NOT USE WATER OR FOAM ON FIRE.</b> Evacuate surrounding area.
<b>Exposure</b>	Call for medical aid.  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing is difficult, give oxygen.  <b>LIQUID</b> Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk. <b>DO NOT INDUCE VOMITING.</b>
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Chemical and Physical Treatment:  
 Neutralize  
 Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
 2.2 Formula: CH<sub>3</sub>COCl  
 2.3 IMO/UN Designation: 8/1717  
 2.4 DOT ID No.: 1717  
 2.5 CAS Registry No.: 75-36-5  
 2.6 NAERG Guide No.: 132  
 2.7 Standard Industrial Trade Classification: 51371

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety goggles; rubber or plastic gloves; self-contained breathing apparatus.  
 3.2 **Symptoms Following Exposure:** Vapor irritates mucous membranes. Ingestion of liquid or contact with eyes or skin causes severe irritation.  
 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; seek medical attention. EYES: flush with copious amounts of water. SKIN: flush with copious amounts of water. INGESTION: give plenty of water; do NOT induce vomiting.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Readily hydrolyzes to form hydrochloric and acetic acids. Oral human LD<sub>50</sub> = 1470 mg/kg (acetic acid). Grade 2; oral rat LD<sub>50</sub> = 3310 mg/kg (acetic acid).  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
 3.12 **Odor Threshold:** Acetic acid-1 ppm; hydrochloric acid-1 ppm  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 40°F C.C.  
 4.2 **Flammable Limits in Air:** 5% lower limit  
 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam  
 4.5 **Special Hazards of Combustion Products:** When heated to decomposition, hydrogen chloride and phosgene, extremely poisonous gases, are evolved.  
 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
 4.7 **Auto Ignition Temperature:** 734°F  
 4.8 **Electrical Hazards:** I, D  
 4.9 **Burning Rate:** 2.6 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously with water, evolving hydrogen chloride fumes (hydrochloric acid).  
 5.2 **Reactivity with Common Materials:** May form phosgene and HCl when heated to decomposition. Is highly corrosive to most metals in the presence of moisture.  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Following dilution with water, limestone or sodium bicarbonate can be used.  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 10-100 ppm (est.)  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 1  
 Human Oral hazard: I  
 Human Contact hazard: II  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Stable  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	2
Special (White).....	W

 8.6 **EPA Reportable Quantity:** 5000  
 8.7 **EPA Pollution Category:** D  
 8.8 **RCRA Waste Number:** U006  
 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 78.5  
 9.3 **Boiling Point at 1 atm:** 124°F = 51°C = 324°K  
 9.4 **Freezing Point:** -170°F = -112°C = 161°K  
 9.5 **Critical Temperature:** (est.) 475°F = 246°C = 519°K  
 9.6 **Critical Pressure:** (est.) 845 psia = 57.5 atm = 5.83 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 1.1039 at 21°C (liquid)  
 9.8 **Liquid Surface Tension:** 26 dynes/cm = 0.026 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** Not pertinent  
 9.10 **Vapor (Gas) Specific Gravity:** 3  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1467  
 9.12 **Latent Heat of Vaporization:** 160 Btu/lb = 88 cal/g = 3.7 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -6,000 Btu/lb = -3,300 cal/g = -140 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** (est.) -54 Btu/lb = -30 cal/g = -1.3 X 10<sup>5</sup> J/kg  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ACETYL CHLORIDE

ACC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	72.599	40	0.346	35	1.087	35	0.548
50	71.349	50	0.347	40	1.083	40	0.530
60	70.099	60	0.349	45	1.080	45	0.512
70	68.849	70	0.350	50	1.077	50	0.496
80	67.599	80	0.352	55	1.074	55	0.481
90	66.360	90	0.353	60	1.071	60	0.466
100	65.110	100	0.354	65	1.068	65	0.452
110	63.860	110	0.356	70	1.065	70	0.439
120	62.611	120	0.357	75	1.061	75	0.426
				80	1.058	80	0.414
				85	1.055	85	0.402
				90	1.052	90	0.391
				95	1.049	95	0.381
				100	1.046	100	0.371
				105	1.043	105	0.361
				110	1.040	110	0.352
				115	1.036	115	0.343
				120	1.033	120	0.335

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	40	2.118	40	0.03100	100	0.203
	E	50	2.737	50	0.03927	120	0.207
	A	60	3.502	60	0.04928	140	0.211
	C	70	4.440	70	0.06130	160	0.214
	T	80	5.579	80	0.07560	180	0.218
	S	90	6.953	90	0.09251	200	0.222
		100	8.598	100	0.11230	220	0.225
		110	10.550	110	0.13550	240	0.229
		120	12.860	120	0.16220	260	0.232
		130	15.570	130	0.19300	280	0.236
		140	18.720	140	0.22830	300	0.240
		150	22.380	150	0.26850	320	0.243
		160	26.610	160	0.31400	340	0.247
		170	31.460	170	0.36530	360	0.250
		180	36.990	180	0.42290	380	0.254
		190	43.290	190	0.48720	400	0.258
		200	50.410	200	0.55880	420	0.261
		210	58.440	210	0.63820	440	0.265

# ACRIDINE

ACD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 10-Azaanthracene Benzo (b) quinoline Dibenzo [b,e] pyridine	Solid	Yellow	Weak irritating odor
Sinks in water.			
Avoid contact with solid and dust. Keep people away. Avoid inhalation. Shut off ignition sources. Call fire department. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with water or foam. Carbon dioxide and dry chemicals may be ineffective on fire.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse small amounts  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
2.2 Formula: C<sub>13</sub>H<sub>9</sub>N  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2713  
2.5 CAS Registry No.: 260-94-6  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51489

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; chemical goggles; rubber gloves  
3.2 **Symptoms Following Exposure:** Inhalation irritates respiratory system and causes sneezing, crying, and vomiting. Contact with liquid irritates eyes, skin, and mucous membranes. At high temperature and during sun exposure, damage to the cornea, skin, and mucous membranes may occur following the liberation of acridine vapor.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if breathing has stopped, give artificial respiration; if breathing is difficult, give oxygen. EYES: wash with copious amounts of water for 20 min.; seek medical attention. SKIN: wash with large amounts of water for 20 min.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 2,000 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, foam, monoammonium phosphate, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Carbon dioxide and dry chemicals may not be effective.  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.  
4.6 **Behavior in Fire:** Sublimes before melting  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.7 ppm\*/perch/kill/fresh water  
\*Time period not specified  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed  
8.7 **EPA Pollution Category:** Not listed  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 179.08  
9.3 **Boiling Point at 1 atm:** 655°F = 346°C = 619°K  
9.4 **Freezing Point:** 230°F = 110°C = 383°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (approx.) 1.2 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -15,800 Btu/lb = -8790 cal/g = -368 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ACRIDINE

ACD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ACETYLENE

ACE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethine Ethyne	Compressed gas      Colorless      Mild garlic odor  This flammable gas is slightly lighter than air, and will disperse slowly unless confined.
Shut off ignition sources and call fire department. Stop discharge if possible. Keep people away. Avoid inhalation. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along gas trail may occur. May explode if ignited in an enclosed area. Stop flow of gas if possible. Cool exposed containers and protect men effecting the shutoff with water. Let fire burn.
<b>Exposure</b>	CALL FOR MEDICAL AID. GAS Not irritating to eyes, nose or throat. If inhaled will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $C_2H_2$
- 2.3 IMO/UN Designation: 2.0/1001
- 2.4 DOT ID No.: 1001
- 2.5 CAS Registry No.: 74-86-2
- 2.6 NAERG Guide No.: 116
- 2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air supply respirator in areas of high concentration. Avoid all sources of ignition.
- 3.2 **Symptoms Following Exposure:** Headache, dizziness and loss of consciousness may occur. Death from "smothering" may occur if oxygen content of the air is severely reduced by dilution with acetylene.
- 3.3 **Treatment of Exposure:** INHALATION: no specific antidote known; remove victim to fresh air, keep him warm and quiet, and call a doctor; recovery is usually rapid. If patient is unconscious, administer oxygen; if breathing has stopped, give artificial respiration.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Not pertinent
- 3.10 **Vapor (Gas) Irritant Characteristics:** None
- 3.11 **Liquid or Solid Characteristics:** Not pertinent
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Gas
- 4.2 **Flammable Limits in Air:** 2.5%-100%
- 4.3 **Fire Extinguishing Agents:** Stop flow of gas
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Carbon dioxide, dry chemical and water spray are not generally recommended because the discharged gas or volatile liquid may create a more serious explosion hazard.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** May explode in fire
- 4.7 **Auto Ignition Temperature:** 581°F
- 4.8 **Electrical Hazards:** Not pertinent Class I, Group A
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** 2907. (Est.)
- 4.11 **Stoichiometric Air to Fuel Ratio:** 13.18 (Est.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Under certain conditions forms spontaneously explosive compounds with copper
- 5.3 **Stability During Transport:** Stable as shipped
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1000 cc/1hr/sunfish/not killed/fresh water
- 6.2 **Waterfowl Toxicity:** Not pertinent
- 6.3 **Biological Oxygen Demand (BOD):** Not pertinent
- 6.4 **Food Chain Concentration Potential:** Not pertinent
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial grade acetylene is supplied dissolved in acetone under pressure in cylinders.
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	3
- 8.6 **EPA Reportable Quantity:** Not listed
- 8.7 **EPA Pollution Category:** Not listed
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 26.04
- 9.3 **Boiling Point at 1 atm:** -119°F = 84.0°C = 189.2°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** 95.4°F = 35.2°C = 308.4°K
- 9.6 **Critical Pressure:** 890.7 psia = 60.59 atm = 6.138 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.613 at -80°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 0.9
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.235
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** -20,747 Btu/lb = -11,526 cal/g = -482.57 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ACETYLENE

ACE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	N O T  P E R T I N E N T	-112 -110 -108 -106 -104 -102 -100 -98 -96 -94 -92 -90 -88 -86 -84 -82 -80 -78 -76	19.360 20.560 21.810 23.130 24.510 25.950 27.460 29.030 30.670 32.390 34.170 36.040 37.980 40.000 42.100 44.290 46.560 48.920 51.370	-112 -110 -108 -106 -104 -102 -100 -98 -96 -94 -92 -90 -88 -86 -84 -82 -80 -78 -76	0.13510 0.14260 0.15050 0.15860 0.16720 0.17600 0.18520 0.19470 0.20460 0.21490 0.22550 0.23650 0.24790 0.25970 0.27190 0.28450 0.29750 0.31090 0.32480	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.376 0.386 0.394 0.403 0.411 0.419 0.427 0.434 0.441 0.448 0.455 0.461 0.467 0.473 0.479 0.484 0.489 0.494 0.499 0.504 0.509 0.513 0.517 0.521 0.525

# ALLYL CHLOROFORMATE

ACF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Allyl chlorocarbonate	Watery liquid	Colorless	Extremely irritating odor
Sinks in water. Flammable, irritating vapor is produced.			
Stop discharge if possible. Keep people away. Shut off ignition sources. Call fire department. Avoid inhalation. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse small amounts  
Stop discharge  
Collection Systems: Pump; Dredge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $\text{CH}_2=\text{CHCH}_2\text{O}^-\text{COCl}$   
2.3 IMO/UN Designation: 8/1722  
2.4 DOT ID No.: 1722  
2.5 CAS Registry No.: 2937-50-0  
2.6 NAERG Guide No.: 155  
2.7 Standard Industrial Trade Classification: 51374

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Vapor-proof protective goggles and face shield; plastic or rubber gloves, shoes and clothing; gas mask or self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** Vapor irritates eyes and respiratory tract. Contact with liquid causes eye and skin irritation, and ingestion irritates mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; support respiration if necessary; call physician. EYES: if irritated by either vapor or liquid, flush with water for at least 15 min. SKIN: wash with large amounts of water for at least 15 min. INGESTION: do NOT induce vomiting; give water; call physician.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50} = 50$  to 500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** 1.4 ppm
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 92°F O.C. 88°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective
- 4.5 **Special Hazards of Combustion Products:** When heated to decomposition, emits highly toxic phosgene gas.
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** I, D
- 4.9 **Burning Rate:** 4.9 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly, generating hydrogen chloride.
- 5.2 **Reactivity with Common Materials:** Corrodes metals
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with lime or sodium bicarbonate solution.
- 5.5 **Polymerization:** Currently not available.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 97+%
- 7.2 **Storage Temperature:** Keep cool
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** Not listed
- 8.7 **EPA Pollution Category:** Not listed
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 120.5
- 9.3 **Boiling Point at 1 atm:** 235°F = 113°C = 386°K
- 9.4 **Freezing Point:** -112°F = -80°C = 193°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.139 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 4.15
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0804
- 9.12 **Latent Heat of Vaporization:** (est.) 100 Btu/lb = 56 cal/g =  $2.3 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** (est.) -7,800 Btu/lb = -4,300 cal/g =  $-180 \times 10^5$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ALLYL CHLOROFORMATE

ACF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	72.339	34	0.450	34	1.048	34	0.958
36	72.270	36	0.450	36	1.048	36	0.940
38	72.200	38	0.450	38	1.048	38	0.923
40	72.129	40	0.450	40	1.048	40	0.906
42	72.059	42	0.450	42	1.048	42	0.889
44	71.990	44	0.450	44	1.048	44	0.873
46	71.919	46	0.450	46	1.048	46	0.858
48	71.849	48	0.450	48	1.048	48	0.842
50	71.790	50	0.450	50	1.048	50	0.827
52	71.719	52	0.450	52	1.048	52	0.813
54	71.650	54	0.450	54	1.048	54	0.799
56	71.580	56	0.450	56	1.048	56	0.785
58	71.509	58	0.450	58	1.048	58	0.772
60	71.440	60	0.450	60	1.048	60	0.758
62	71.370	62	0.450	62	1.048	62	0.746
64	71.299	64	0.450	64	1.048	64	0.733
66	71.230	66	0.450	66	1.048	66	0.721
68	71.160	68	0.450	68	1.048	68	0.709
70	71.089	70	0.450	70	1.048	70	0.698
72	71.020	72	0.450	72	1.048	72	0.686
74	70.950	74	0.450	74	1.048	74	0.675
76	70.879	76	0.450	76	1.048	76	0.664
78	70.809	78	0.450	78	1.048	78	0.654
80	70.750	80	0.450	80	1.048	80	0.644
82	70.679	82	0.450	82	1.048	82	0.633
84	70.610	84	0.450	84	1.048	84	0.624

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	4.950	60	0.10690	100	0.230
	N	65	5.538	65	0.11850	120	0.236
	S	70	6.182	70	0.13100	140	0.241
	O	75	6.888	75	0.14460	160	0.247
	L	80	7.658	80	0.15930	180	0.252
	U	85	8.498	85	0.17510	200	0.257
	B	90	9.413	90	0.19220	220	0.263
	L	95	10.410	95	0.21060	240	0.268
	E	100	11.480	100	0.23030	260	0.273
		105	12.650	105	0.25150	280	0.278
		110	13.910	110	0.27420	300	0.284
		115	15.280	115	0.29840	320	0.289
		120	16.750	120	0.32430	340	0.294
						360	0.299
						380	0.304
						400	0.309
						420	0.314
						440	0.319

# AMMONIUM CHROMATE

ACH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diammonium chromate Neutral ammonium chromate	Solid crystals      Yellow      Ammonia odor  Sinks and mixes with water.
Avoid contact with solid. Keep people away. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available. May explode when shocked or heated. Extinguish with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID POISONOUS IF SWALLOWED OR INHALED. Irritating or corrosive to skin and mucous membranes. Severely irritating to eyes. Remove contaminated clothing. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b>  2.1 CG Compatibility Group: Not listed 2.2 Formula: $(\text{NH}_4)_2\text{CrO}_4$ 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 7788-98-9 2.6 NAERG Guide No.: 143 2.7 Standard Industrial Trade Classification: 51481
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Wear rubber gloves, industrial filter mask, face shield and safety glasses. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: May cause irritation or ulceration of mucous membranes. EYES: Causes severe irritation and conjunctivitis. SKIN: Irritation, ulceration (chrome sores) where breaks in skin occur. INGESTION: Tends to act as its own emetic and purgative. Can cause stomach and kidney damage if retained. 3.3 <b>Treatment of Exposure:</b> Call a physician. INHALATION: Move to fresh air. EYES: Flush with water. SKIN: Wash with soap and water. INGESTION: Dilute with water or milk. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Currently not available. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Dust can cause lung cancer; a recognized carcinogen. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Not pertinent 3.11 <b>Liquid or Solid Characteristics:</b> Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion**  
**Products:** Decomposes producing toxic combustion products.
- 4.6 **Behavior in Fire:** Can explode when heated or shocked.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Forms alkaline solution which evolves free ammonia.
- 5.2 **Reactivity with Common Materials:** Not pertinent
- 5.3 **Stability During Transport:** Stable - avoid shock, heat, and contact with reducing materials.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Dissolve in water. Cover with soda ash and mix. Neutralize with 6 M HCl.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
96-hour  $\text{TL}_{50}$ , Mosquito fish = 240 mg/l  
48 hour  $\text{TL}_{50}$  = 270 mg/l
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
High positive. Trout can accumulate hexavalent Cr at levels as low as 0.001 ppm. Half life in total human body 616 days.
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
Currently not available
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 152.09
- 9.3 **Boiling Point at 1 atm:** Not pertinent, decomposes  $356^\circ\text{F} = 180^\circ\text{C} = 453.2^\circ\text{K}$
- 9.4 **Freezing Point:** Decomposes  $356^\circ\text{F} = 180^\circ\text{C} = 453.2^\circ\text{K}$
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.91 at  $12^\circ\text{C}$
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Endothermic (at  $25^\circ\text{C}$ )  
 $68.6 \text{ Btu/lb} = 38.1 \text{ cal/g} = 1.6 \times 10^5 \text{ J/kg}$
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# AMMONIUM CHROMATE

ACH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
40 50 60 70 80 90 100 110 120 130 140 150 160	25.079 29.319 32.145 34.164 35.678 36.856 37.798 38.569 39.211 39.755 40.221 40.625 40.978		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMMONIUM CITRATE, DIBASIC

ACI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium citrate Citric acid, diammonium salt Diammonium citrate	Solid  White  Weak ammonia odor  Sinks and mixes with water.
Stop discharge if possible. Keep people away. Avoid contact with solid and dust; avoid inhalation. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{HOC}(\text{CO}_2\text{H})(\text{CH}_2\text{CO}_2\text{NH}_4)_2$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 3012-65-5
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Approved dust respirator; eye goggles
- 3.2 Symptoms Following Exposure: Inhalation causes respiratory irritation. Ingestion causes diarrhea. Contact with eyes causes mild irritation.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air. EYES: flush with water or physiological saline; get medical care if irritation persists. SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent (combustible solid)
- 4.2 Flammable Limits in Air: Not pertinent
- 4.3 Fire Extinguishing Agents: Water
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Toxic ammonia gas may form in fire.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Currently not available
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 5000
- 8.7 EPA Pollution Category: D
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 226
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.48 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# AMMONIUM CITRATE, DIBASIC

ACI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	100.000		N O T P E R T I N E N T		N O T P E R T I N E N T		N O T P E R T I N E N T

# ALUMINUM CHLORIDE

ACL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Anhydrous aluminum chloride	Solid crystals or powder  Sinks in water. Poisonous gas is produced on contact with water.	Yellow-orange to grayish-white  Irritating odor
<b>Fire</b> Not flammable. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Do not use water on adjacent fires. Extinguish adjacent fires with dry chemical or foam.		
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b> DUST Irritating to eyes, nose and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $AlCl_3$
- 2.3 IMO/UN Designation: 8.0/1726
- 2.4 DOT ID No.: 1726
- 2.5 CAS Registry No.: 7446-70-0
- 2.6 NAERG Guide No.: 137
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** All personnel in the area should wear safety clothing, including fully closed goggles, rubber or plastic-coated gloves, rubber shoes, and coveralls of acid-resistant material. An acid-vapor canister mask should be carried in case of emergency. In certain applications, it may be advisable to wear this equipment on a routine basis.
- 3.2 **Symptoms Following Exposure:** Contact with the skin or eyes in the presence of moisture causes thermal and acid burns.
- 3.3 **Treatment of Exposure:** INGESTION: if victim is conscious have him drink water or milk. Do NOT induce vomiting. SKIN: flush immediately with plenty of water. For eye contact, flush with water for at least 15 mins. and get medical attention immediately.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** No systemic effects, but severe burns of mouth.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None recognized
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor (of hydrogen chloride) is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** 1-5 ppm (hydrogen chloride)
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water on adjacent fires
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Reacts violently with water used in extinguishing adjacent fires
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently with water, liberating hydrogen chloride gas and heat.
- 5.2 **Reactivity with Common Materials:** None if dry. If wet it attacks metals because of hydrochloric acid formed; flammable hydrogen is formed.
- 5.3 **Stability During Transport:** Stable if kept dry and protected from atmospheric moisture.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Hydrochloric acid formed by reaction with water can be flushed away with water. Rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Not pertinent
- 6.2 **Waterfowl Toxicity:** Not pertinent
- 6.3 **Biological Oxygen Demand (BOD):** Not pertinent
- 6.4 **Food Chain Concentration Potential:** Not pertinent
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure: 99.7%; technical: 98.5%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	2
Special (White).....	W
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 133.34
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** 381°F = 193.9°C = 467.1°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.44 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 63.6 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ALUMINUM CHLORIDE

ACL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMMONIUM CARBAMATE

ACM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium aminofornate Anhydride of ammonium carbonate Carbamic acid, ammonium salt	Solid crystalline powder  White  Ammonia odor  Mixes with water.
<b>Wear goggles, self-contained breathing apparatus, and rubber gloves. Keep people away. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	COMBUSTIBLE. POISONOUS GAS MAY BE PRODUCED IN FIRE OR WHEN HEATED. Wear self-contained breathing apparatus, goggles, rubber gloves, and normal protective gear. Extinguish with CO <sub>2</sub> dry chemical, or water spray.
<b>Exposure</b>	CALL FOR MEDICAL AID. Irritating to eyes, nose, and throat. Harmful if swallowed. Move to fresh air. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula: NH<sub>4</sub>COONH<sub>4</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 1111-78-0
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 51471

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber gloves, safety glasses, normal protective gear.
- 3.2 **Symptoms Following Exposure:** INHALATION: Irritating to mucous membranes of respiratory tract. EYES: Irritating.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove to fresh air.
- 3.4 **TLV-TWA:** 25 ppm as NH<sub>3</sub>. Material decomposes in air releasing ammonia. Contains 44% NH<sub>3</sub>.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 35 ppm as NH<sub>3</sub>.
- 3.7 **Toxicity by Ingestion:** LD50=1400 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Carbamates are suspected carcinogens of lungs and hematopoietic organs.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** <5 ppm as NH<sub>3</sub> (detection); 46.8 ppm as NH<sub>3</sub> (recognition).
- 3.13 **IDLH Value:** 300 ppm as NH<sub>3</sub>
- 3.14 **OSHA PEL-TWA:** 50 ppm as NH<sub>3</sub>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, or water spray
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Moderate fire and explosion hazards when exposed to heat or flame
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
None
- 5.3 **Stability During Transport:** Unstable - decomposes in air, changing to ammonium carbonate. Volatilizes at 60°C.
- 5.4 **Neutralizing Agents for Acids and Caustics:** None
- 5.5 **Polymerization:** Does not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Decomposes to (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub> and NH<sub>3</sub> 5.5 to 7.0 mg/l (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub> - lethal to fish. Toxicity threshold for freshwater fish appears to be between 30 to 40 ppm (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub>.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Cool
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 5000
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 78.07
- 9.3 **Boiling Point at 1 atm:** Sublimes 140°F = 60°C = 333.2°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** Currently not available
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (Est.) at 25°C -2612 Btu/lb = -1451 cal/g = -60.7 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** (Endothermic) 86.9 Btu/lb = 48.3 cal/g = 2.02 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# AMMONIUM CARBAMATE

ACM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E		NOT P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E		NOT P E R T I N E N T

# ACRYLONITRILE

ACN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cyanoethylene Fumigrain Ventox Vinyl cyanide	Watery liquid      Colorless to light yellow      Irritating odor  Floats on water. Poisonous, flammable vapor is produced.
<p><b>AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.</b>  Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).  Shut off ignition sources and call fire department.  Stop discharge if possible.  Stay upwind and use water spray to "knock down" vapor.  Evacuate area in case of large discharge.  Isolate and remove discharged material.  Notify local health and pollution control agencies; protect water intakes.</p>	
<b>Fire</b>	<b>FLAMMABLE.</b> <b>POISONOUS GASES MAY BE PRODUCED IN FIRE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from a safe distance or protected location. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> <b>POISONOUS IF INHALED.</b> Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> <b>POISONOUS IF SWALLOWED</b> Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	<b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim; Pump and dredge contaminated material  
Clean shoreline  
Salvage waterfowl  
Do not burn

### 2. CHEMICAL DESIGNATIONS

**2.1 CG Compatibility Group:** 15; Substituted allyl  
**2.2 Formula:** CH<sub>2</sub>=CHCN  
**2.3 IMO/UN Designation:** 3.1/1093  
**2.4 DOT ID No.:** 1093  
**2.5 CAS Registry No.:** 107-13-1  
**2.6 NAERG Guide No.:** 131P  
**2.7 Standard Industrial Trade Classification:** 51483

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Air-supplied mask, industrial chemical type, with approved canister for acrylonitrile in low (less than 2%) concentrations; rubber or plastic gloves; cover goggles or face mask; rubber boots; slicker suit; safety helmet.
- 3.2 Symptoms Following Exposure:** Similar to those of hydrogen cyanide. Vapor inhalation may cause weakness, headache, sneezing, abdominal pain, and vomiting. Similar symptoms shown if large amounts of liquid are absorbed through the skin; lesser amounts cause stinging and sometimes blisters; contact with eyes causes severe irritation. Ingestion produces nausea, vomiting and abdominal pain.
- 3.3 Treatment of Exposure:** Skilled medical treatment is necessary; call physician for all cases of exposure. **INHALATION:** remove victim to fresh air. (Wear an oxygen or fresh-air-supplied mask when entering contaminated area.) **INGESTION:** induce vomiting by administering strong solution of salt water, but only if victim is conscious. **SKIN:** remove contaminated clothing and wash affected area thoroughly with soap and water. **EYES:** hold eyelids apart and wash with continuous gentle stream of water for at least 15 min. If victim is not breathing, give artificial respiration until physician arrives. If he is unconscious, crush an amyl nitrite ampule in a cloth and hold it under his nose for 15 seconds in every minute. Do not interrupt artificial respiration while doing this. Replace ampule when its strength is spent and continue treatment until condition improves or physician arrives.
- 3.4 TLV-TWA:** 2 ppm  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> 50 to 500 mg/kg (rat, guinea pig)  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
**3.11 Liquid or Solid Characteristics:** If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. Large amounts may be absorbed through the skin and cause poisoning.  
**3.12 Odor Threshold:** 21.4 ppm (Sense of smell fatigues rapidly).  
**3.13 IDLH Value:** 85 ppm.  
**3.14 OSHA PEL-TWA:** 2 ppm.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** 10 ppm.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 31°F O.C. 30°F C.C.  
**4.2 Flammable Limits in Air:** 3.05%-17.0%  
**4.3 Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
**4.5 Special Hazards of Combustion Products:** When heated or burned, ACN may evolve toxic hydrogen cyanide gas and oxides of nitrogen.  
**4.6 Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. May polymerize and explode.  
**4.7 Auto Ignition Temperature:** 898°F  
**4.8 Electrical Hazards:** Class I, Group D  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Currently not available  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Currently not available  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** Attacks copper and copper alloys; these metals should not be used. Penetrates leather, so contaminated leather shoes and gloves should be destroyed. Attacks aluminum in high concentrations.  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** May occur spontaneously in absence of oxygen or on exposure to visible light or excessive heat, violently in the presence of alkali. Pure ACN is subject to self-polymerization with rapid pressure development. The commercial product is inhibited and not subject to this reaction.  
**5.6 Inhibitor of Polymerization:** Methylhydroquinone (35-45 ppm)

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** 100 ppm/24 hr/all fish/100% killed/fresh water  
0.05-1 ppm/24 hr/bluegill/lethal/salt water  
**6.2 Waterfowl Toxicity:** Not pertinent  
**6.3 Biological Oxygen Demand (BOD):** 70%, 5 days  
**6.4 Food Chain Concentration Potential:** None noted  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Technical: 98-100%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Pressure-vacuum  
**7.5 IMO Pollution Category:** B  
**7.6 Ship Type:** 2  
**7.7 Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid  
**8.2 49 CFR Class:** 3  
**8.3 49 CFR Package Group:** I  
**8.4 Marine Pollutant:** Not listed.  
**8.5 NFPA Hazard Classification:**
- |                           |                |
|---------------------------|----------------|
| Category                  | Classification |
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 2              |
- 8.6 EPA Reportable Quantity:** 100  
**8.7 EPA Pollution Category:** B  
**8.8 RCRA Waste Number:** U009  
**8.9 EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 53.06  
**9.3 Boiling Point at 1 atm:** 171°F = 77.4°C = 350.6°K  
**9.4 Freezing Point:** -118°F = -83.6°C = 189.6°K  
**9.5 Critical Temperature:** 505.4°F = 263°C = 536.2°K  
**9.6 Critical Pressure:** 660 psia = 45 atm = 4.6 MN/m<sup>2</sup>  
**9.7 Specific Gravity:** 0.8075 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** Not pertinent  
**9.9 Liquid Water Interfacial Tension:** Not pertinent  
**9.10 Vapor (Gas) Specific Gravity:** 1.8  
**9.11 Ratio of Specific Heats of Vapor (Gas):** 1.151  
**9.12 Latent Heat of Vaporization:** 265 Btu/lb = 147 cal/g = 6.16 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -14,300 Btu/lb = -7930 cal/g = 332 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 3.5 psia

### NOTES



# ACRYLONITRILE

ACN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	52.800	28	0.499	75	1.150		N O T  P E R T I N E N T
5	52.620	30	0.499	80	1.143		
10	52.450	32	0.499	85	1.136		
15	52.280	34	0.499	90	1.128		
20	52.100	36	0.499	95	1.121		
25	51.930	38	0.499	100	1.114		
30	51.760	40	0.499	105	1.107		
35	51.580	42	0.499	110	1.099		
40	51.410	44	0.499	115	1.092		
45	51.240	46	0.499	120	1.085		
50	51.060	48	0.499	125	1.078		
55	50.890	50	0.499	130	1.070		
60	50.720	52	0.499	135	1.063		
65	50.540	54	0.499	140	1.056		
70	50.370	56	0.499	145	1.049		
75	50.190	58	0.499	150	1.041		
80	50.020	60	0.499	155	1.034		
85	49.850	62	0.499	160	1.027		
90	49.670	64	0.499				
95	49.500	66	0.499				
100	49.330	68	0.499				
105	49.150	70	0.499				
110	48.980	72	0.499				
115	48.810	74	0.499				
120	48.630	76	0.499				
125	48.460	78	0.499				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
70	8.000	0	0.193	0	0.00208	0	0.261
		10	0.277	10	0.00291	25	0.270
		20	0.390	20	0.00402	50	0.280
		30	0.540	30	0.00545	75	0.289
		40	0.735	40	0.00727	100	0.297
		50	0.987	50	0.00957	125	0.306
		60	1.306	60	0.01242	150	0.314
		70	1.707	70	0.01593	175	0.323
		80	2.205	80	0.02019	200	0.331
		90	2.815	90	0.02532	225	0.338
		100	3.558	100	0.03142	250	0.346
		110	4.452	110	0.03863	275	0.354
		120	5.520	120	0.04707	300	0.361
		130	6.786	130	0.05688	325	0.368
		140	8.274	140	0.06820	350	0.375
		150	10.010	150	0.08117	375	0.382
		160	12.030	160	0.09594	400	0.389
		170	14.350	170	0.11260	425	0.395
		180	17.010	180	0.13150	450	0.401
		190	20.040	190	0.15250	475	0.408
		200	23.480	200	0.17590	500	0.414
		210	27.360	210	0.20190	525	0.420
		220	31.710	220	0.23060	550	0.425
		230	36.570	230	0.26210	575	0.431
						600	0.437

# ALUMINUM CHLORIDE SOLUTION

ACO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Liquid	Clear, colorless to amber	Mild, pungent odor, like hydrochloric acid
<p>Wear goggles, approved respirator and rubber overclothing (including gloves). Neutralize with sodium carbonate, lime, or limestone. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.</p>			
<b>Fire</b>	Not flammable. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Use extinguishing agents appropriate for the surrounding fire. Use water spray to cool exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Corrosive. May burn eyes, respiratory tract and skin. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $AlCl_3 \cdot H_2O$   
2.3 IMO/UN Designation: Data not available.  
2.4 DOT ID No.: 2581  
2.5 CAS Registry No.: 7446-70-0  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear impervious protective clothing and gloves to prevent skin contact. Wear splashproof chemical safety goggles and approved respirator.  
3.2 **Symptoms Following Exposure:** The material is corrosive and contact with the skin, eyes or respiratory tract may cause sever skin irritation and burns.  
3.3 **Treatment of Exposure:** Call for medical aid. INGESTION: If victim is conscious have him drink water or milk. SKIN: Flush immediately with plenty of water. EYES: Flush with water for at least 15 mins., lifting lids occasionally.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral  $LD_{50} = 770$  mg/Kg (mouse).  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None recognized.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** Data not available.  
3.13 **IDLH Value:** Data not available.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable.  
4.2 **Flammable Limits in Air:** Not pertinent.  
4.3 **Fire Extinguishing Agents:** Use extinguishing agents appropriate for the surrounding fire.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.  
4.5 **Special Hazards of Combustion Products:** At elevated temperatures, the material will decompose, producing hydrogen chloride.  
4.6 **Behavior in Fire:** Not pertinent.  
4.7 **Auto Ignition Temperature:** Not pertinent.  
4.8 **Electrical Hazards:** Not pertinent.  
4.9 **Burning Rate:** Not pertinent.  
4.10 **Adiabatic Flame Temperature:** Not pertinent.  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Not pertinent.  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:**  
Corrosive to many metals, such as aluminum, steel, copper, and zinc.  
Reaction will produce flammable hydrogen gas.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Sodium carbonate (soda ash), lime (calcium hydroxide), or limestone (calcium carbonate).  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Data not available.  
6.2 **Waterfowl Toxicity:** Data not available.  
6.3 **Biological Oxygen Demand (BOD):** Data not available.  
6.4 **Food Chain Concentration Potential:**  
Data not available.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 32° Baume (28-32%)  
7.2 **Storage Temperature:** Data not available.  
7.3 **Inert Atmosphere:** Data not available.  
7.4 **Venting:** None.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive Material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 133.34  
9.3 **Boiling Point at 1 atm:** 230°F = 110°C = 383°K  
9.4 **Freezing Point:** -30°F = -34°C = 239°K  
9.5 **Critical Temperature:** Data not available.  
9.6 **Critical Pressure:** Data not available.  
9.7 **Specific Gravity:** 1.2800  
9.8 **Liquid Surface Tension:** Data not available.  
9.9 **Liquid Water Interfacial Tension:** Data not available.  
9.10 **Vapor (Gas) Specific Gravity:** Data not available.  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Data not available.  
9.12 **Latent Heat of Vaporization:** Data not available.  
9.13 **Heat of Combustion:** Not pertinent.  
9.14 **Heat of Decomposition:** Data not available.  
9.15 **Heat of Solution:** Data not available.  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Data not available.  
9.18 **Limiting Value:** Data not available.  
9.19 **Reid Vapor Pressure:** Data not available.

### NOTES

# ALUMINUM CHLORIDE SOLUTION

ACO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
39	10.700		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# ACETOPHENONE

ACP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetylbenzene Methyl phenyl ketone 1-Phenylethanone	Liquid  Colorless  Flowery, sweet odor  Sinks slowly in water. Freezing point is 68°F.
Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin or eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $C_8H_8O$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 98-86-2  
2.6 NAERG Guide No.: Not listed.  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Protect eyes and skin from direct contact.  
3.2 **Symptoms Following Exposure:** No toxicity expected from inhalation or ingestion except slight narcotic effect. Liquid can cause eye and skin irritation on contact.  
3.3 **Treatment of Exposure:** SKIN OR EYE CONTACT: irrigate affected area with water for 15 min.  
3.4 **TLV-TWA:** 10 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50}$  = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.01-0.025 mg/m<sup>3</sup>  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 180°F O.C.  
4.2 **Flammable Limits in Air:** 1.1 ; 6.7  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** None  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 1058°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None noted  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical: 99+% acetophenone  
7.2 **Storage Temperature:** Not pertinent  
7.3 **Inert Atmosphere:** Not pertinent  
7.4 **Venting:** Not pertinent  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** 5000  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** U004  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 120.15  
9.3 **Boiling Point at 1 atm:** 395.1°F = 201.7°C = 474.9°K  
9.4 **Freezing Point:** 67.5°F = 19.7°C = 292.9°K  
9.5 **Critical Temperature:** 802.4°F = 428°C = 701.2°K  
9.6 **Critical Pressure:** 560 pisa = 38 atm = 3.8 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.028 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 12 dynes/cm = 0.012 N/m at 30°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 27°C  
9.10 **Vapor (Gas) Specific Gravity:** 4.1  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.071  
9.12 **Latent Heat of Vaporization:** 150 Btu/lb = 83.6 cal/g = 3.5 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -14,850 Btu/lb = -8250 cal/g = -345.4 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ACETOPHENONE

ACP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
70	64.110	68	0.474	67	0.998	68	1.872
75	63.950	70	0.474			70	1.841
80	63.800	72	0.474			72	1.811
85	63.640	74	0.474			74	1.781
90	63.480	76	0.474			76	1.753
95	63.330	78	0.474			78	1.724
100	63.170	80	0.474			80	1.697
105	63.010	82	0.474			82	1.670
110	62.860	84	0.474			84	1.644
115	62.700	86	0.474			86	1.618
120	62.550						
125	62.390						
130	62.230						
135	62.080						
140	61.920						
145	61.770						
150	61.610						
155	61.450						
160	61.300						
165	61.140						
170	60.990						
175	60.830						
180	60.670						
185	60.520						
190	60.360						
195	60.210						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.550	220	0.632	220	0.01042	30	0.231
		230	0.798	230	0.01295	40	0.236
		240	0.998	240	0.01596	50	0.241
		250	1.239	250	0.01954	60	0.246
		260	1.527	260	0.02374	70	0.250
		270	1.868	270	0.02866	80	0.255
		280	2.271	280	0.03437	90	0.260
		290	2.744	290	0.04097	100	0.264
		300	3.295	300	0.04855	110	0.269
		310	3.934	310	0.05721	120	0.273
		320	4.671	320	0.06706	130	0.278
		330	5.518	330	0.07822	140	0.282
		340	6.487	340	0.09079	150	0.287
		350	7.588	350	0.10490	160	0.291
		360	8.837	360	0.12070	170	0.295
		370	10.250	370	0.13820	180	0.300
		380	11.830	380	0.15770	190	0.304
		390	13.610	390	0.17920	200	0.308
		400	15.590	400	0.20300	210	0.312
		410	17.790	410	0.22900	220	0.317
		420	20.240	420	0.25750	230	0.321
		430	22.940	430	0.28870	240	0.325
		440	25.920	440	0.32250	250	0.329
		450	29.200	450	0.35930	260	0.333
		460	32.790	460	0.39910		
		470	36.720	470	0.44210		

# ACRYLIC ACID

ACR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethylene carboxylic acid Propenoic acid Vinyl formic acid	Watery liquid  Sinks and mixes with water. Irritating vapor is produced. Freezing point is 54°F.	Colorless  Irritating odor
Avoid contact with liquid and vapor. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. POISONOUS GAS MAY BE PRODUCED IN FIRE. Containers may explode when heated. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from safe distance or protected location. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 4; Organic acid  
2.2 Formula:  $\text{CH}_2=\text{CHCOOH}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2218  
2.5 CAS Registry No.: 79-10-7  
2.6 NAERG Guide No.: 132P  
2.7 Standard Industrial Trade Classification: 51379

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical respirator at ambient temperatures to avoid inhalation of noxious fumes; rubber gloves if exposed to wet material; acid goggles or face shield for splash exposure; safety shower and/or eye fountain may be required.
- 3.2 **Symptoms Following Exposure:** May burn skin or eyes upon short contact. INHALATION: eye and nasal irritation and lacrimation. INGESTION: may cause severe damage to the gastrointestinal tract.
- 3.3 **Treatment of Exposure:** Get medical attention promptly for all exposures. INHALATION: remove victim to fresh air. INGESTION: do NOT induce vomiting. SKIN OR EYES: flush with water for at least 15 min.
- 3.4 TLV-TWA: 2 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Not pertinent  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes of contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** (Glacial) 118°F O.C.  
4.2 **Flammable Limits in Air:** (Tech.) 2.4% LEL; (Glacial) 2.0% LEL; 8.0% UEL  
4.3 **Fire Extinguishing Agents:** Water spray, alcohol foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic vapors are generated when heated  
4.6 **Behavior in Fire:** May polymerize and explode  
4.7 **Auto Ignition Temperature:** 820°F  
4.8 **Electrical Hazards:** I, D  
4.9 **Burning Rate:** 1.6 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Normally unstable but will not detonate.  
5.4 **Neutralizing Agents for Acids and Cautics:** Wash with water, rinse with sodium bicarbonate solution.  
5.5 **Polymerization:** May occur on contact with acids, iron salts, or at elevated temperatures and release high energy rapidly; may cause explosion under confinement.  
5.6 **Inhibitor of Polymerization:** Monomethyl ether of hydroquinone 180-200 ppm; phenothiazine (for tech. grades) 1000 ppm; hydroquinone (0.1%); methylene blue (0.5-1%); N, N-diphenyl- p-phenylenediamine (0.05%)

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 35%, 10 days  
6.4 **Food Chain Concentration Potential:** None listed  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 94.0%; glacial: 98.0-99.5%  
7.2 **Storage Temperature:** 60°-75°F  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	2

  
8.6 EPA Reportable Quantity: 5000  
8.7 EPA Pollution Category: D  
8.8 RCRA Waste Number: U008  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 72.06  
9.3 **Boiling Point at 1 atm:** 286.3°F = 141.3°C = 414.5°K  
9.4 **Freezing Point:** 54.1°F = 12.3°C = 285.5°K  
9.5 **Critical Temperature:** 647.6°F = 342°C = 615.2°K  
9.6 **Critical Pressure:** 840 psia = 57 atm = 5.8 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.0497 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.121  
9.12 **Latent Heat of Vaporization:** 272.7 Btu/lb = 151.5 cal/g = 6.343 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -8100 Btu/lb = -4500 cal/g = -188.4 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** -463 Btu/lb = -257 cal/g = -10.8 X 10<sup>5</sup> J/kg  
9.17 **Heat of Fusion:** 30.03 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.2 psia

### NOTES

# ACRYLIC ACID

ACR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
55	65.980	106	0.460		N		N
60	65.790	108	0.460		O		O
65	65.599	110	0.460		T		T
70	65.400	112	0.460				
75	65.209	114	0.460		P		P
80	65.020	116	0.460		E		E
85	64.830	118	0.460		R		R
90	64.639	120	0.460		T		T
95	64.450	122	0.460		I		I
100	64.259	124	0.460		N		N
105	64.070	126	0.460		E		E
110	63.880	128	0.460		N		N
115	63.690	130	0.460		T		T
120	63.500	132	0.460				
125	63.310	134	0.460				
130	63.120	136	0.460				
135	62.930	138	0.460				
140	62.730	140	0.460				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	60	0.059	60	0.00077	0	0.229
	I	65	0.071	65	0.00090	25	0.238
	S	70	0.084	70	0.00106	50	0.248
	C	75	0.099	75	0.00124	75	0.257
	I	80	0.116	80	0.00145	100	0.266
	B	85	0.136	85	0.00168	125	0.275
	L	90	0.160	90	0.00195	150	0.283
	E	95	0.186	95	0.00226	175	0.292
		100	0.217	100	0.00260	200	0.300
		105	0.252	105	0.00299	225	0.308
		110	0.291	110	0.00343	250	0.316
		115	0.336	115	0.00393	275	0.323
		120	0.387	120	0.00448	300	0.331
		125	0.445	125	0.00511	325	0.338
		130	0.510	130	0.00581	350	0.345
		135	0.583	135	0.00658	375	0.351
		140	0.665	140	0.00745	400	0.358
		145	0.758	145	0.00841	425	0.365
		150	0.861	150	0.00948	450	0.371
		155	0.976	155	0.01066	475	0.377
						500	0.383
						525	0.389
						550	0.394
						575	0.400
						600	0.405

# ACETONE

ACT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dimethyl ketone Propanone 2-Propanone	Watery liquid      Colorless      Sweet odor  Floats and mixes with water. Flammable, irritating vapor is produced.
Stay upwind and use water spray to "knock down" vapor. Shut off ignition sources and call fire department. Keep people away. Stop discharge if possible. Isolate and remove discharged material. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>DO NOT INDUCE VOMITING</b> <b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, may cause difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to eyes. Not irritating to skin. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 18; Ketone
- 2.2 Formula:  $\text{CH}_3\text{COCH}_3$
- 2.3 IMO/UN Designation: 3.1/1090
- 2.4 DOT ID No.: 1090
- 2.5 CAS Registry No.: 67-64-1
- 2.6 NAERG Guide No.: 127
- 2.7 Standard Industrial Trade Classification: 51623

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor canister or air-supplied mask; synthetic rubber gloves; chemical safety goggles or face splash shield.
- 3.2 **Symptoms Following Exposure:** INHALATION: vapor irritating to eyes and mucous membranes; acts as an anesthetic in very high concentrations. INGESTION: low order of toxicity but very irritating to mucous membranes. SKIN: prolonged excessive contact causes defatting of the skin, possibly leading to dermatitis.
- 3.3 **Treatment of Exposure:** INHALATION: if victim is overcome, remove to fresh air and call a physician; administer artificial respiration if breathing is irregular or stopped. INGESTION: if victim has swallowed large amounts and is conscious and not having convulsions, induce vomiting and get medical help promptly; no specific antidote known. SKIN: wash well with water. EYES: flush with water immediately for at least 15 min. Consult a physician.
- 3.4 **TLV-TWA:** 500 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 750 ppm.
- 3.7 **Toxicity by Ingestion:** Grade 1;  $\text{LD}_{50} = 5$  to 15 g/kg (dog)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Not pertinent
- 3.10 **Vapor (Gas) Irritant Characteristics:** If present in high concentrations, vapors cause moderate irritation of the eyes or respiratory system. Effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly from the skin.
- 3.12 **Odor Threshold:** 100 ppm
- 3.13 **IDLH Value:** 2,500 ppm
- 3.14 **OSHA PEL-TWA:** 1,000 ppm.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 1°F C.C.
- 4.2 **Flammable Limits in Air:** 2.6%-12.8%
- 4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water in straight hose stream will scatter and spread fire and should not be used.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 869°F
- 4.8 **Electrical Hazards:** I, D
- 4.9 **Burning Rate:** 3.9 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Avoid contact with strong oxidizing agents, acids
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 14,250 ppm/24 hr/sunfish/killed/tap water  
 13,000 ppm/48 hr/mosquito fish/TL<sub>50</sub>/turbid water
- 6.2 **Waterfowl Toxicity:** Not pertinent
- 6.3 **Biological Oxygen Demand (BOD):** (Theor) 122%, 5 days
- 6.4 **Food Chain Concentration Potential:** None noted
- 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 0  
 Human Oral hazard: 1  
 Human Contact hazard: I  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 99.5% plus 0.5% water Reagent: 99.5% plus 0.5% water
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester) or pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 5000
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** U002
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 58.08
- 9.3 **Boiling Point at 1 atm:** 133°F = 56.1°C = 329.3°K
- 9.4 **Freezing Point:** -138°F = -94.7°C = 178.5°K
- 9.5 **Critical Temperature:** 455.0°F = 235°C = 508.2°K
- 9.6 **Critical Pressure:** 682 psia = 46.4 atm = 4.70 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.791 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 2.0
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.127
- 9.12 **Latent Heat of Vaporization:** 220 Btu/lb = 122 cal/g = 5.11 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -12,250 Btu/lb = -6808 cal/g = -285.0 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 23.42 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 7.25 psia

### NOTES



# ACETONE

ACT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-120	56.350	34	0.507	30	1.193		N O T  P E R T I N E N T
-110	55.980	36	0.508	35	1.184		
-100	55.620	38	0.508	40	1.174		
-90	55.250	40	0.509	45	1.164		
-80	54.880	42	0.510	50	1.155		
-70	54.520	44	0.511	55	1.145		
-60	54.150	46	0.512	60	1.135		
-50	53.780	48	0.513	65	1.126		
-40	53.400	50	0.514	70	1.116		
-30	53.030	52	0.514	75	1.106		
-20	52.650	54	0.515	80	1.097		
-10	52.280	56	0.516	85	1.087		
0	51.900	58	0.517	90	1.077		
10	51.520	60	0.518	95	1.068		
20	51.140	62	0.519	100	1.058		
30	50.760	64	0.519	105	1.048		
40	50.380	66	0.520				
50	50.000	68	0.521				
60	49.610	70	0.522				
70	49.230	72	0.523				
80	48.840	74	0.524				
90	48.450	76	0.525				
100	48.070	78	0.525				
110	47.680	80	0.526				
120	47.280	82	0.527				
		84	0.528				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		-20	0.245	-20	0.00302	0	0.275
		-10	0.354	-10	0.00426	25	0.286
		0	0.501	0	0.00590	50	0.296
		10	0.698	10	0.00804	75	0.307
		20	0.956	20	0.01079	100	0.317
		30	1.291	30	0.01427	125	0.327
		40	1.719	40	0.01862	150	0.337
		50	2.260	50	0.02399	175	0.347
		60	2.935	60	0.03056	200	0.357
		70	3.770	70	0.03851	225	0.367
		80	4.791	80	0.04803	250	0.377
		90	6.029	90	0.05934	275	0.386
		100	7.516	100	0.07266	300	0.395
		110	9.290	110	0.08823	325	0.405
		120	11.390	120	0.10630	350	0.414
		130	13.850	130	0.12710	375	0.423
		140	16.720	140	0.15090	400	0.431
		150	20.060	150	0.17800	425	0.440
		160	23.890	160	0.20860	450	0.449
		170	28.290	170	0.24310	475	0.457
		180	33.300	180	0.28170	500	0.466
		190	38.980	190	0.32460	525	0.474
						550	0.482
						575	0.490
						600	0.498

# ACETONE CYANOHYDRIN

ACY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> alpha-Hydroxy isobutyronitrile 2-Hydroxy-2-methylpropanenitrile 2-Methylacetonitrile Propanenitrile, 2-hydroxy-2-methyl	Watery liquid  Colorless  Mild, almond odor.  Floats and mixes with water. Poisonous vapor is produced.
<b>AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.</b> Wear chemical protective suit with self-contained breathing apparatus. Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED WHEN HEATED. Vapor may explode if ignited in an enclosed area. WEAR CHEMICAL PROTECTIVE SUIT WITH SELF-CONTAINED BREATHING APPARATUS. Combat fires from safe distance or from protected location. Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

- Dilute and disperse
- Stop discharge
- Contain
- Collection Systems: Skim
- Salvage waterfowl
- Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>C(OH)CN
- 2.3 IMO/UN Designation: 6.1/1541
- 2.4 DOT ID No.: 1541
- 2.5 CAS Registry No.: 75-86-5
- 2.6 NAERG Guide No.: 155
- 2.7 Standard Industrial Trade Classification: 51484

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask with canister approved for use with acrylonitrile in less than 2% concentrations; rubber or plastic gloves; cover goggles or face mask; rubber boots; slicker suit; safety helmet.
- 3.2 **Symptoms Following Exposure:** At low dosages the earliest symptoms may be weakness, headaches, confusion and occasionally nausea and vomiting. Respiratory rate and depth will usually be increased at the beginning and at later stages become slow and gasping.
- 3.3 **Treatment of Exposure:** Call a physician for all cases of exposure. INHALATION: remove victim to fresh air. (Rescuer should wear suitable mask.) INGESTION: if victim is conscious, induce vomiting by having him drink strong salt water. SKIN: remove contaminated clothing and wash affected skin thoroughly with soap and water. EYES: hold eyelids apart and wash with continuous, gentle stream of water for at least 15 min. If breathing has stopped, give artificial respiration until physician arrives. If victim is unconscious, administer amyl nitrite by crushing an ampule in a cloth and holding it under his nose for 15 seconds in every minute. Do not interrupt artificial respiration during this procedure. Replace ampule when its strength is spent; continue treatment until victim's condition improves or physician arrives.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: 4.7 ppm as CN
- 3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> below 50 mg/kg (mice); LD<sub>50</sub> =17mg/kg (rats)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes liver damage in rats
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors irritate the eyes and respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 165°F C.C.
- 4.2 **Flammable Limits in Air:** 2.2%-12%
- 4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, alcohol foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic hydrogen cyanide is generated when heated
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 1270°F
- 4.8 **Electrical Hazards:** I, D
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 0.57 mg/L /96 hr/LC50 /bluegill sunfish
- 6.2 **Waterfowl Toxicity:** Not pertinent
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 3  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98-99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** A
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	2
Instability (Yellow).....	2
- 8.6 EPA Reportable Quantity: 10
- 8.7 EPA Pollution Category: A
- 8.8 RCRA Waste Number: P069
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 85.11
- 9.3 **Boiling Point at 1 atm:** Decomposes (~74.4C)
- 9.4 **Freezing Point:** -5.8°F = -21°C = 252°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.925 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.074
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.3 psia

### NOTES

# ACETONE CYANOHYDRIN

ACY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	58.330	28	0.693		N		N
62	58.260	30	0.693		O		O
64	58.190	32	0.693		T		T
66	58.120	34	0.693				
68	58.050	36	0.693		P		P
70	57.980	38	0.693		E		E
72	57.910	40	0.693		R		R
74	57.850	42	0.693		T		T
76	57.780	44	0.693		I		I
78	57.710	46	0.693		N		N
80	57.640	48	0.693		E		E
82	57.570	50	0.693		N		N
84	57.500	52	0.693		T		T
86	57.430	54	0.693				
88	57.360	56	0.693				
90	57.290	58	0.693				
92	57.220	60	0.693				
94	57.150	62	0.693				
		64	0.693				
		66	0.693				
		68	0.693				
		70	0.693				
		72	0.693				
		74	0.693				
		76	0.693				
		78	0.693				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	28	0.001	28	0.00002	30	0.324
	I	30	0.001	30	0.00002	40	0.329
	S	32	0.001	32	0.00002	50	0.333
	C	34	0.001	34	0.00002	60	0.337
	I	36	0.001	36	0.00002	70	0.341
	B	38	0.002	38	0.00003	80	0.345
	L	40	0.002	40	0.00003	90	0.349
	E	42	0.002	42	0.00003	100	0.353
		44	0.002	44	0.00003	110	0.357
		46	0.002	46	0.00004	120	0.361
		48	0.002	48	0.00004	130	0.365
		50	0.003	50	0.00004	140	0.369
		52	0.003	52	0.00005	150	0.373
		54	0.003	54	0.00005	160	0.377
		56	0.004	56	0.00005	170	0.381
		58	0.004	58	0.00006	180	0.385
		60	0.004	60	0.00006	190	0.388
		62	0.005	62	0.00007	200	0.392
		64	0.005	64	0.00007	210	0.396
		66	0.005	66	0.00008	220	0.399
		68	0.006	68	0.00009	230	0.403
		70	0.006	70	0.00009	240	0.407
		72	0.007	72	0.00010	250	0.410
		74	0.007	74	0.00011	260	0.414
		76	0.008	76	0.00012		
		78	0.009	78	0.00013		

# ADIPIC ACID

ADA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Adipinic acid 1,4-Butanedicarboxylic acid Hexanedioic acid	Solid crystals      White      Odorless  Sinks and mixes slowly with water.
Stop discharge if possible. Keep people away. Shut off ignition sources. Call fire department. Avoid contact with solid and dust; avoid inhalation. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Dust cloud may explode if ignited in an enclosed area. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $\text{HOOC}(\text{CH}_2)_4\text{COOH}$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 124-04-9  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Normal protection against exposure to finely divided organic solids (rubber gloves, plastic goggles)  
3.2 **Symptoms Following Exposure:** Inhalation of vapor irritates mucous membranes of the nose and lungs, causing coughing and sneezing. Contact with liquid irritates eyes and has a pronounced drying effect on the skin; may produce dermatitis.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; get medical attention if irritation persists. EYES: flush with water for at least 15 min. SKIN: flush with water.  
3.4 TLV-TWA: 5 mg/m<sup>3</sup>  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral mouse  $\text{LD}_{50}$  = 1,900 mg/kg; oral rat  $\text{LD}_{50}$  = 5,050 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Combustible solid, 385°F O.C.; 376°F C.C.  
4.2 **Flammable Limits in Air:** (dust) 10-15 mg/l  
4.3 **Fire Extinguishing Agents:** Foam, water fog, carbon dioxide, or dry chemical.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Melts and may decompose to give volatile acidic vapors of valeric acid and other substances. Dust may form explosive mixture with air.  
4.7 **Auto Ignition Temperature:** 788°F; 450°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Rinse with dilute sodium bicarbonate or soda ash solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
<330 ppm/24 hr/bluegill/TL<sub>96</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** (theoretical) 1.3%, 0.5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 99.8%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	-
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 5000  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 146.1  
9.3 **Boiling Point at 1 atm:** Not pertinent 337.5°C  
9.4 **Freezing Point:** 304°F = 151°C = 424°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.36 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -8,242 Btu/lb = -4,579 cal/g = 191.6 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ADIPIC ACID

ADA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.111	395	0.160	395	0.00254		N
36	0.222	400	0.180	400	0.00286		O
38	0.333	405	0.204	405	0.00321		T
40	0.444	410	0.230	410	0.00360		
42	0.555	415	0.259	415	0.00403		P
44	0.666	420	0.291	420	0.00451		E
46	0.777	425	0.327	425	0.00504		R
48	0.889	430	0.367	430	0.00562		T
50	1.000	435	0.412	435	0.00626		I
52	1.111	440	0.461	440	0.00697		N
54	1.222	445	0.515	445	0.00775		E
56	1.333	450	0.575	450	0.00860		N
58	1.444	455	0.641	455	0.00954		T
60	1.555	460	0.714	460	0.01056		
62	1.666	465	0.794	465	0.01169		
64	1.778	470	0.882	470	0.01292		
66	1.889	475	0.979	475	0.01426		
68	2.000	480	1.086	480	0.01572		
70	2.111	485	1.202	485	0.01732		
72	2.222	490	1.330	490	0.01906		
74	2.333	495	1.470	495	0.02095		
76	2.444	500	1.622	500	0.02301		
78	2.555	505	1.789	505	0.02524		
80	2.666	510	1.971	510	0.02766		
82	2.778	515	2.169	515	0.03029		
84	2.889						

# ADIPONITRILE

ADN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,4-Dicyanobutane Hexanedinitrile	Liquid      Colorless to light yellow      Odorless  Floats on water. Freezing point is 36°F.
Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Vapor may explode if ignited in an enclosed area. Wear chemical protective suit with self-contained breathing apparatus. Extinguish with water, dry chemicals, foam or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Clean shore line  
 Salvage waterfowl  
 Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 37; Nitrile  
 2.2 **Formula:** NC(CH<sub>2</sub>)<sub>4</sub>CN  
 2.3 **IMO/UN Designation:** Not listed  
 2.4 **DOT ID No.:** 2205  
 2.5 **CAS Registry No.:** 111-69-3  
 2.6 **NAERG Guide No.:** 153  
 2.7 **Standard Industrial Trade Classification:** 51484

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves and clothing giving full body and face protection to avoid contact with skin. Air or oxygen mask.
- 3.2 **Symptoms Following Exposure:** Ingestion of a few ml. may cause weakness, mental confusion, vomiting, rapid respiration, and tachycardia and convulsions. Headache and convulsions can result from exposure to vapor.
- 3.3 **Treatment of Exposure:** Symptomatic treatment. Call physician. Thiosulfate should be considered. Administer vapor of amyl nitrite if patient is unconscious.
- 3.4 **TLV-TWA:** 2 ppm (skin).
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** oral LD50 250mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** If present in high concentrations, vapors cause a slight smarting of the eyes or respiratory system and may also cause more severe symptoms such as headache and convulsions.
- 3.11 **Liquid or Solid Characteristics:** If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. If absorbed by skin may cause more severe symptoms such as headache and convulsions.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 325°F C.C.
- 4.2 **Flammable Limits in Air:** LFL = 1.0% at 200°C
- 4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, foam, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic gases are generated in fires.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 550C (1022 F)
- 4.8 **Electrical Hazards:** I, D
- 4.9 **Burning Rate:** 2.7 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 670 ppm/96 hr/rainbow trout/LC50  
 820 mg/L /96 hr / fathead minnows/LC50  
 1250 ppm/24 hr/sunfish/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 40%, 5 days
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 1  
 Human Oral hazard: 3  
 Human Contact hazard: I  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Stable
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** Not listed
- 8.7 **EPA Pollution Category:** Not listed
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 108
- 9.3 **Boiling Point at 1 atm:** 554°F = 290°C = 563°K
- 9.4 **Freezing Point:** 36°F = 2.4°C = 275.5°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.9611 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** (est.) 240 Btu/lb = 134 cal/g = 5.59 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -14,230 Btu/lb = -7910 cal/g = -331 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Low

### NOTES

# ADIPONITRILE

ADN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
55	60.420	85	0.480	75	1.221	65	7.070
60	60.280	90	0.480	80	1.218	70	6.564
65	60.140	95	0.480	85	1.215	75	6.103
70	60.010	100	0.480	90	1.211	80	5.681
75	59.870	105	0.480	95	1.208	85	5.296
80	59.740	110	0.480	100	1.205	90	4.943
85	59.610	115	0.480	105	1.202	95	4.619
90	59.480	120	0.480	110	1.199	100	4.322
95	59.350	125	0.480	115	1.196	105	4.049
100	59.230	130	0.480	120	1.193	110	3.797
105	59.100	135	0.480	125	1.190	115	3.565
110	58.980	140	0.480	130	1.187	120	3.351
115	58.860	145	0.480	135	1.184	125	3.153
120	58.740	150	0.480	140	1.181		
125	58.620			145	1.178		
130	58.500			150	1.175		
				155	1.172		
				160	1.169		
				165	1.166		
				170	1.163		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMYL ACETATE (ALL ISOMERS)

AEC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Amyl acetate, mixed isomers Acetic acid, n-amyl ester Pentyl acetates	Watery liquid	Colorless to yellow	Banana odor
Floats on water. Flammable, irritating vapor is produced.			
<b>Shut off ignition sources and call fire department.</b> <b>Stop discharge if possible. Keep people away.</b> <b>Avoid contact with liquid and vapor.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Isolate and remove discharged material.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, headache or dizziness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $\text{CH}_3\text{COOC}_5\text{H}_{11}$   
2.3 IMO/UN Designation: 3.2/1104  
2.4 DOT ID No.: 1104  
2.5 CAS Registry No.: 628-63-7  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask or chemical cartridge respirator, protective gloves, goggles, safety shower, and eye bath.  
3.2 **Symptoms Following Exposure:** Irritation of eyes, nose and throat. Dizziness, nausea, headache.  
3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air; call physician; administer oxygen. SKIN OR EYES: flush with water.  
3.4 **TLV-TWA:** 100 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1;  $\text{LD}_{50} = 6.5 \text{ g/kg (rat)}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentration. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.067 ppm  
3.13 **IDLH Value:** 1,000 ppm.  
3.14 **OSHA PEL-TWA:** 100 ppm.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 106 F (O.C.) (iso-); 69°F C.C. (n-); 91°F C.C.  
4.2 **Flammable Limits in Air:** 1.1%-7.5% (n)  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water in straight hose stream will scatter and spread fire and should not be used  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 680°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4.1 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 120 ppm/48 hr/daphnia/TL<sub>50</sub>/turbid water  
180 ppm/96 hr/scenedesmus/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0.3-0.8 lb/lb, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 85-96% (technical, commercial)  
7.2 **Storage Temperature:** Ambient (cool)  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 5000  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 130.19  
9.3 **Boiling Point at 1 atm:** 295°F = 146°C = 419°K  
9.4 **Freezing Point:** < -148°F = < -100°C = < 173°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.876 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 12 dynes/cm = 0.012 N/m at 30°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 17°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1  
9.12 **Latent Heat of Vaporization:** 140 Btu/lb = 75 cal/g =  $3.1 \times 10^5 \text{ J/kg}$   
9.13 **Heat of Combustion:** -13,360 Btu/lb = -7423 cal/g =  $-310.8 \times 10^5 \text{ J/kg}$   
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.1 psia

### NOTES



# AMYL ACETATE (ALL ISOMERS)

AEC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	56.110	40	0.453	28	0.962	52	1.557
36	56.040	50	0.457	30	0.960	54	1.473
38	55.970	60	0.460	32	0.958	56	1.395
40	55.900	70	0.464	34	0.956	58	1.321
42	55.830	80	0.468	36	0.955	60	1.251
44	55.760	90	0.471	38	0.953	62	1.186
46	55.700	100	0.475	40	0.951	64	1.124
48	55.630	110	0.479	42	0.949	66	1.066
50	55.560	120	0.482	44	0.948	68	1.012
52	55.490	130	0.486	46	0.946	70	0.961
54	55.420	140	0.490	48	0.944	72	0.912
56	55.350	150	0.493	50	0.943	74	0.867
58	55.280	160	0.497	52	0.941	76	0.824
60	55.210	170	0.501	54	0.939	78	0.783
62	55.140	180	0.504	56	0.937	80	0.745
64	55.070	190	0.508	58	0.936	82	0.709
66	55.000	200	0.512	60	0.934	84	0.674
68	54.930	210	0.515	62	0.932	86	0.642
70	54.860			64	0.931		
72	54.790			66	0.929		
74	54.720			68	0.927		
76	54.650			70	0.925		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.200	40	0.030	40	0.00072	0	0.288
		50	0.042	50	0.00101	25	0.300
		60	0.060	60	0.00140	50	0.312
		70	0.084	70	0.00192	75	0.323
		80	0.116	80	0.00260	100	0.334
		90	0.158	90	0.00348	125	0.346
		100	0.212	100	0.00460	150	0.357
		110	0.283	110	0.00604	175	0.367
		120	0.375	120	0.00784	200	0.378
		130	0.490	130	0.01008	225	0.388
		140	0.636	140	0.01286	250	0.399
		150	0.818	150	0.01627	275	0.409
		160	1.043	160	0.02042	300	0.419
		170	1.321	170	0.02544	325	0.429
		180	1.660	180	0.03147	350	0.438
		190	2.071	190	0.03866	375	0.448
		200	2.567	200	0.04719	400	0.457
		210	3.161	210	0.05725	425	0.466
		220	3.869	220	0.06904	450	0.475
		230	4.708	230	0.08280	475	0.484
		240	5.697	240	0.09876	500	0.493
		250	6.857	250	0.11720	525	0.502
		260	8.210	260	0.13840	550	0.510
		270	9.782	270	0.16260	575	0.518
		280	11.600	280	0.19020	600	0.526
		290	13.690	290	0.22150		

# AMINOETHYLETHANOLAMINE

AEE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-[(2-Aminoethyl) amino] ethanol N-(2-Aminoethyl) ethanolamine N-Hydroxyethyl-1,2- ethanediamine N-Beta- Hydroxyethylethylenediamine	Liquid  Colorless  Mild ammonia odor  Sinks and mixes with water.
Avoid contact with liquid. Keep people away. Wear rubber overclothing. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Currently not available; Alkanolamine  
2.2 **Formula:** HOCH<sub>2</sub>CH<sub>2</sub>NHCH<sub>2</sub>CH<sub>2</sub>NH<sub>2</sub>  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** 3055  
2.5 **CAS Registry No.:** 111-41-1  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51461

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield, protective clothing  
3.2 **Symptoms Following Exposure:** Skin contact will cause mild irritation; eye contact will cause more severe irritation.  
3.3 **Treatment of Exposure:** INGESTION: do NOT induce vomiting; call physician immediately. SKIN: wash area with plenty of water. EYES: flush thoroughly with running water, preferably for 15 min.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** High concentrations of vapor may cause a slight smarting of the eyes or respiratory system. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 265°F O.C.  
4.2 **Flammable Limits in Air:** 1%-8% (calc.)  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 695°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 0  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Elevated  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 104.15  
9.3 **Boiling Point at 1 atm:** 469°F = 243°C = 516°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.028 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.053  
9.12 **Latent Heat of Vaporization:** (est.) 209 Btu/lb = 116 cal/g = 4.85 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -12,300 Btu/lb = -6860 cal/g = -287 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -4 Btu/lb = -2 cal/g = -0.1 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# AMINOETHYLETHANOLAMINE

AEE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	64.169	28	0.645		C		C
61	64.169	30	0.645		U		U
62	64.169	32	0.645		R		R
63	64.169	34	0.645		R		R
64	64.169	36	0.645		E		E
65	64.169	38	0.645		N		N
66	64.169	40	0.645		T		T
67	64.169	42	0.645		L		L
68	64.169	44	0.645		Y		Y
69	64.169	46	0.645				
70	64.169	48	0.645		N		N
71	64.169	50	0.645		O		O
72	64.169	52	0.645		T		T
73	64.169	54	0.645				
74	64.169	56	0.645		A		A
75	64.169	58	0.645		V		V
76	64.169	60	0.645		A		A
77	64.169	62	0.645		I		I
78	64.169	64	0.645		L		L
79	64.169	66	0.645		A		A
80	64.169	68	0.645		B		B
81	64.169	70	0.645		L		L
82	64.169	72	0.645		E		E
83	64.169	74	0.645				
84	64.169	76	0.645				
85	64.169	78	0.645				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C	40	0.000	40	0.00000	0	0.351
	U	60	0.000	60	0.00000	10	0.356
	R	80	0.000	80	0.00001	20	0.360
	R	100	0.001	100	0.00001	30	0.365
	E	120	0.002	120	0.00003	40	0.369
	N	140	0.004	140	0.00007	50	0.374
	T	160	0.009	160	0.00014	60	0.378
	L	180	0.018	180	0.00028	70	0.383
	Y	200	0.035	200	0.00052	80	0.387
		220	0.065	220	0.00093	90	0.391
	N	240	0.116	240	0.00161	100	0.396
	O	260	0.201	260	0.00270	110	0.400
	T	280	0.336	280	0.00441	120	0.404
		300	0.547	300	0.00699	130	0.408
	A	320	0.870	320	0.01082	140	0.413
	V	340	1.350	340	0.01638	150	0.417
	A	360	2.052	360	0.02429	160	0.421
	I	380	3.057	380	0.03532	170	0.425
	L					180	0.429
	A					190	0.433
	B					200	0.437
	L					210	0.441
	E					220	0.445
						230	0.449
						240	0.453
						250	0.457

# ACETAL

AEL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetaldehyde diethylacetal 1,1-Diethoxyethane Diethyl acetal Ethylidene diethylether USAF DO-45	Liquid  Colorless  Agreeable, nutty aftertaste  Floats on water.
Avoid contact with liquid or vapor. Keep people away. Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources. Call fire department. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>EXTREMELY FLAMMABLE</b> May react with oxygen to form explosive peroxides. Flashback along vapor trail may occur. DO NOT USE WATER TO FIGHT FIRE. Extinguish with dry chemical, CO <sub>2</sub> , or alcohol foam. Wear self-contained breathing apparatus and full protective clothing.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> May be harmful if inhaled or absorbed through skin. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Harmful if ingested or absorbed through the skin. May cause irritation to eyes and skin. IF IN EYES: flush with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Flush affected areas with plenty of running water. IF SWALLOWED: do nothing except keep victim warm.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed 2.2 Formula: (C <sub>2</sub> H <sub>5</sub> O) <sub>2</sub> -CHCH <sub>3</sub> 2.3 IMO/UN Designation: 3.1/1088 2.4 DOT ID No.: 1088 2.5 CAS Registry No.: 105-57-7 2.6 NAERG Guide No.: 127 2.7 Standard Industrial Trade Classification: 51612
<b>3. HEALTH HAZARDS</b>  <b>3.1 Personal Protective Equipment:</b> Approved respirator, chemical-resistant gloves, safety goggles, other protective clothing. <b>3.2 Symptoms Following Exposure:</b> May irritate the upper respiratory tract. High concentrations act as a central nervous system depressant. Symptoms of exposure include headache, dizziness, drowsiness, abdominal pain, and nausea. <b>3.3 Treatment of Exposure:</b> INGESTION: Call a physician. Keep victim warm. EYES: Flush with running water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes. Flush affected areas with plenty of water. Wash with soap and water. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 3.5 g/kg (mouse) <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Central nervous system depressant. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: -5°F C.C.  
 4.2 Flammable Limits in Air: 1.65 - 10.4 %  
 4.3 Fire Extinguishing Agents: CO<sub>2</sub>, dry chemical, alcohol foam  
 4.4 Fire Extinguishing Agents Not to Be Used: Do not use water  
 4.5 Special Hazards of Combustion Products: Explosive  
 4.6 Behavior in Fire: In fire, may decompose to form flammable or explosive mixtures in air. Old samples may explode upon heating.  
 4.7 Auto Ignition Temperature: 446°F  
 4.8 Electrical Hazards: Currently not available  
 4.9 Burning Rate: Currently not available  
 4.10 Adiabatic Flame Temperature: Currently not available  
 4.11 Stoichiometric Air to Fuel Ratio: Currently not available  
 4.12 Flame Temperature: Currently not available  
 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available  
 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
 5.2 Reactivity with Common Materials: No reaction  
 5.3 Stability During Transport: Stable  
 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
 5.5 Polymerization: May polymerize on standing.  
 5.6 Inhibitor of Polymerization: Currently not available

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
 6.2 Waterfowl Toxicity: Currently not available  
 6.3 Biological Oxygen Demand (BOD): Currently not available  
 6.4 Food Chain Concentration Potential: Currently not available  
 6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99%  
 7.2 Storage Temperature: Currently not available  
 7.3 Inert Atmosphere: None  
 7.4 Venting: None  
 7.5 IMO Pollution Category: Currently not available  
 7.6 Ship Type: Currently not available  
 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
 8.2 49 CFR Class: 3  
 8.3 49 CFR Package Group: II  
 8.4 Marine Pollutant: Yes  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

 8.6 EPA Reportable Quantity: Not listed  
 8.7 EPA Pollution Category: Not listed  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
 9.2 Molecular Weight: 148.17  
 9.3 Boiling Point at 1 atm: 216°F = 102°C = 375°K  
 9.4 Freezing Point: -148°F = -100°C = 173°K  
 9.5 Critical Temperature: Currently not available  
 9.6 Critical Pressure: Currently not available  
 9.7 Specific Gravity: 0.831 at 20°C  
 9.8 Liquid Surface Tension: 21.65 dyne/cm = 0.022 N/m at 20°C  
 9.9 Liquid Water Interfacial Tension: Currently not available  
 9.10 Vapor (Gas) Specific Gravity: 4.1  
 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
 9.12 Latent Heat of Vaporization: 119.2 Btu/lb = 66.2 cal/g = 2.8 X 10<sup>5</sup> J/kg  
 9.13 Heat of Combustion: Currently not available  
 9.14 Heat of Decomposition: Currently not available  
 9.15 Heat of Solution: Currently not available  
 9.16 Heat of Polymerization: Currently not available  
 9.17 Heat of Fusion: Currently not available  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: 1.1 psia

## NOTES

# ACETAL

AEL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	51.900		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	6.000	0 20 40 60 80 100 120 140 160 180 200	0.055 0.095 0.164 0.285 0.494 0.857 1.487 2.579 4.471 7.754 13.446		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.317 0.328 0.338 0.349 0.359 0.370 0.380 0.391 0.401 0.412 0.422 0.433 0.443 0.454 0.464 0.475 0.485 0.496 0.506 0.516 0.527 0.537 0.548 0.558 0.569

# N-AMINOETHYL PIPERAZINE

AEP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-(2-Aminoethyl) piperazine N-(2-Aminoethyl) piperazine 1-Piperazine ethanamine USAF DO-46	Liquid	Colorless to light colored
Avoid contact with liquid and vapors. Keep people away. Wear self-contained positive pressure breathing apparatus and full protective clothing. Stay upwind; keep out of low areas. Isolate and remove discharged material. Call Fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. Fire may produce irritating or poisonous gases. Flammable/poisonous gases may accumulate in tanks and hopper cars. May ignite combustibles (wood, paper, oil, etc.). Extinguish with dry chemical, CO <sub>2</sub> , water spray or alcohol foam. Move container from fire area if you can do it without risk. Cool containers that are exposed to flames with water from the side until well after fire is out.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. Move victim to fresh air. If breathing is stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Contact causes burns to skin and eyes. Remove and isolate contaminated clothing and shoes at the site. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. IF SWALLOWED, DO NOT INDUCE VOMITING. Keep victim quiet and maintain normal body temperature.	
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 7; Aliphatic amines <b>2.2 Formula:</b> C <sub>6</sub> H <sub>12</sub> N <sub>2</sub> <b>2.3 IMO/UN Designation:</b> 8/2815 <b>2.4 DOT ID No.:</b> 2815 <b>2.5 CAS Registry No.:</b> 140-31-8 <b>2.6 NAERG Guide No.:</b> 153 <b>2.7 Standard Industrial Trade Classification:</b> 51453
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Wear approved respirator, chemical resistant gloves, safety goggles rubber boots, and protective clothing. <b>3.2 Symptoms Following Exposure:</b> INHALATION: Burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. EYES AND SKIN: Extremely destructive to mucous membranes, upper respiratory tract, eyes and skin. Causes burns on short contact. <b>3.3 Treatment of Exposure:</b> INHALATION: Remove to fresh air; if not breathing, give artificial respiration; if breathing difficult, give oxygen. SKIN: Remove contaminated clothing and shoes; flush affected areas with plenty of water. EYES: Hold eyelids open and flush with water for at least 15 minutes. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 2.14 g/kg (rat) <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause severe irritation of eyes and throat and can cause lung injury. They cannot be tolerated even at low concentrations. <b>3.11 Liquid or Solid Characteristics:</b> Causes second and third degree burns on short contact, and is very injurious to the eyes. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 200°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Dry chemical, alcohol foam, water spray  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion Products:** Toxic fumes of NO<sub>x</sub>  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Currently not available  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Currently not available  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Dry lime, soda ash  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 97%  
**7.2 Storage Temperature:** Currently not available  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** D  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Corrosive material  
**8.2 49 CFR Class:** 8  
**8.3 49 CFR Package Group:** III  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** Not listed  
**8.7 EPA Pollution Category:** Not listed  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 129.24  
**9.3 Boiling Point at 1 atm:** 428°F = 220°C = 493°K  
**9.4 Freezing Point:** -2°F = -19°C = 254°K  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 0.9852 at 20°C  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** 4.4  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# N-AMINOETHYL PIPERAZINE

AEP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.343 0.355 0.366 0.378 0.389 0.401 0.412 0.424 0.435 0.447 0.458 0.470 0.481 0.493 0.504 0.516 0.527 0.539 0.550 0.562 0.574 0.585 0.597 0.608 0.620

# AMMONIUM FLUOBORATE

AFB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium borofluoride Ammonium tetrafluoroborate	Solid crystals      White      Odorless  Sinks and mixes with water.
Wear goggles and self-contained breathing apparatus. Keep people away. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. If inhaled may cause nose bleeds and nausea. Move to fresh air. DUST Irritating to eyes, nose, and throat. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water. Induce vomiting.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{NH}_4\text{BF}_4$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 13826-83-0
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Mechanical filter respirator if dusty or misty; self-contained breathing apparatus if fuming. Rubber gloves; safety glasses (dust) or chemical goggles (mist); full, clean work clothing.
- 3.2 **Symptoms Following Exposure:** INHALATION: May cause irritation of respiratory passages, nose bleeds, and nausea. EYES: May irritate.
- 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air; if symptoms persist consult a physician. EYES: Wash with water for 15 minutes and get medical attention. INGESTION: Give 3 to 4 glasses of water and induce vomiting. Consult a physician.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Not pertinent
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Water spray will probably reduce fume and irritant gases.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Sublimes above 238°C yielding toxic fumes.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 87 ppm reduced BOD 50%
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97.0% minimum
- 7.2 **Storage Temperature:** Ambient (moderate)
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 5000
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 104.9
- 9.3 **Boiling Point at 1 atm:** Not pertinent, sublimates at 460°F = 238°C = 511.2°K
- 9.4 **Freezing Point:** 446°F = 230°C = 503.2°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.871 at 15°C = 1.85 at 17.5°C
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Btu/lb = 144 = cal/g 80.2 = J/kg 3.36 X 10<sup>5</sup> NOTE: these data are for heat of sublimation.
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# AMMONIUM FLUOBORATE

AFB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
80	23.952	80	0.000		C		N
90	29.486	100	0.001		U		O
100	35.020	120	0.003		R		T
110	40.554	140	0.006		R		P
120	46.088	160	0.011		E		E
130	51.622	180	0.018		N		R
140	57.156	200	0.030		T		T
150	62.690	220	0.046		L		I
160	68.224	240	0.070		Y		N
170	73.757	260	0.101				E
180	79.290	280	0.142		N		N
190	84.825	300	0.196		O		T
200	90.358	320	0.264		T		
210	95.893	340	0.350		A		
		360	0.457		V		
		380	0.587		A		
		400	0.744		I		
		420	0.933		L		
		440	1.158		A		
					B		
					L		
					E		

# AMMONIUM FORMATE

AFM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Formic acid, ammonium salt	Solid  White  Weak ammonia odor  Sinks and mixes slowly with water.
Stop discharge if possible. Keep people away. Avoid contact with solid and dust; avoid inhalation. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Irritating gases may be produced when heated. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with water or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{HCOONH}_4$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 540-69-2
- 2.6 NAERG Guide No.: Not listed.
- 2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion irritates mouth and stomach. Contact with eyes or skin causes irritation.
- 3.3 Treatment of Exposure: INHALATION: remove to fresh air. INGESTION: give large amounts of water; get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; oral  $\text{LD}_{50} = 2,250 \text{ mg/kg}$  (mouse)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not pertinent
- 4.3 Fire Extinguishing Agents: Water, foam
- 4.4 Fire Extinguishing Agents Not to Be Used: Currently not available
- 4.5 Special Hazards of Combustion Products: Toxic and irritating ammonia and formic acid gases may form in fire.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Analytical grade; Organic chemical grade
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed
- 8.7 EPA Pollution Category: Not listed
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 63.06
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point:  $241^{\circ}\text{F} = 116^{\circ}\text{C} = 389^{\circ}\text{K}$
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.28 at 25°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution:  $84.7 \text{ Btu/lb} = 47.1 \text{ cal/g} = -1.97 \times 10^5 \text{ J/kg}$
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# AMMONIUM FORMATE

AFM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	104.799		N		N		N
36	107.700		O		O		O
38	110.500		T		T		T
40	113.299						
42	116.200		P		P		P
44	119.000		E		E		E
46	121.799		R		R		R
48	124.700		T		T		T
50	127.500		I		I		I
52	130.299		N		N		N
54	133.199		E		E		E
56	136.000		N		N		N
58	138.799		E		E		E
60	141.699		N		N		N
62	144.500		T		T		T
64	147.299						
66	150.199						
68	153.000						
70	155.799						
72	158.699						
74	161.500						
76	164.299						
78	167.199						
80	170.000						
82	172.799						
84	175.699						

# AMMONIUM FLUORIDE

AFR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Neutral ammonium fluoride	Solid  White  Odorless   Sinks and mixes with water.
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear dust respirator and rubber overclothing (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed  
2.2 **Formula:** NH<sub>4</sub>F  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** 2505  
2.5 **CAS Registry No.:** 12125-01-8  
2.6 **NAERG Guide No.:** 154  
2.7 **Standard Industrial Trade Classification:** 51481

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; rubber gloves
- 3.2 **Symptoms Following Exposure:** Inhalation of dust may cause irritation of respiratory system. Ingestion is harmful; readily soluble fluorides may be fatal if relatively small quantities are swallowed. Contact with eyes causes local irritation of the mucous membrane. Contact with skin may cause burns. High concs. of fluorine in the urine have been reported following skin contact.
- 3.3 **Treatment of Exposure:** Begin first aid as quickly as possible. **INHALATION:** remove to fresh air. **INGESTION:** perform gastric lavage with limewater or 1% calcium chloride solution; support respiration; call a physician. **EYES:** flush with water for 15 min.; consult physician. **SKIN:** shower immediately with large quantities of water; remove all contaminated clothing in the shower at once; consult physician.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic ammonia and hydrogen fluoride gases are formed in fires.
- 4.6 **Behavior in Fire:** May sublime when hot and condense on cool surfaces
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves and forms dilute solution of hydrofluoric acid
- 5.2 **Reactivity with Common Materials:** May corrode glass, cement, and most metals
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 3  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Tech 40% Technical, 96.0%; Reagent; Electronic; Low sodium MOS
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 100
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 37.04
- 9.3 **Boiling Point at 1 atm:** 212 F (100 C) Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.32 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 72 Btu/lb = 40 cal/g = 1.7 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# AMMONIUM FLUORIDE

AFR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	72.379		N		N		N
36	72.950		O		O		O
38	73.530		T		T		T
40	74.110						
42	74.690		P		P		P
44	75.270		E		E		E
46	75.839		R		R		R
48	76.419		T		T		T
50	77.000		I		I		I
52	77.580		N		N		N
54	78.150		E		E		E
56	78.730		N		N		N
58	79.309		E		E		E
60	79.889		N		N		N
62	80.469		T		T		T
64	81.040						
66	81.620						
68	82.200						
70	82.780						
72	83.349						
74	83.929						
76	84.509						
78	85.089						
80	85.669						
82	86.240						
84	86.820						

# AMMONIUM GLUCONATE

AGC

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid

White

Weak ammonia odor

Sinks and mixes with water.

Stop discharge if possible. Keep people away.  
Avoid contact with solid and dust; avoid inhalation.  
Isolate and remove discharged material.  
Notify local health and pollution control agencies.

### Fire

Combustible  
POISONOUS GASES MAY BE PRODUCED IN FIRE.  
Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).  
Extinguish with water.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

SOLID  
Irritating to skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{NH}_4\text{C}_6\text{H}_{11}\text{O}_7$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51481

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Respirator for nuisance dust
- 3.2 Symptoms Following Exposure: Inhalation of dust irritates nose and throat. Contact with eyes causes mild irritation.
- 3.3 Treatment of Exposure: INHALATION: remove to fresh air. EYES or SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not pertinent
- 4.3 Fire Extinguishing Agents: Water
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fires.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Pure
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed
- 8.7 EPA Pollution Category: Not listed
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 213
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: >1 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# AMMONIUM GLUCONATE

AGC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	42.700		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMMONIUM HYPOPHOSPHITE

AHP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Phosphinic acid, ammonium salt		Solid crystals      White
		Sinks and mixes with water.
Stop leak if possible. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	FLAMMABLE. Flammable gas formed when heated to decomposition. Extinguish with CO <sub>2</sub> , dry chemical, or water spray.	
<b>Exposure</b>	Not harmful	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{NH}_4\text{H}_2\text{PO}_2$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Rubber gloves, safety glasses, and normal protective gear.
- 3.2 Symptoms Following Exposure: Non-toxic or low toxicity unless heated to decomposition (240°C).
- 3.3 Treatment of Exposure: Not applicable
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Currently not available
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical, or water spray
- 4.4 Fire Extinguishing Agents Not to Be Used: Currently not available
- 4.5 Special Hazards of Combustion Products: Decomposes at 240°C emitting phosphine and PO<sub>x</sub>. Phosphine is a very toxic gas which ignites spontaneously.
- 4.6 Behavior in Fire: Decomposes when heated with evolution of phosphine which ignites spontaneously.
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Currently not available
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 98% pure
- 7.2 Storage Temperature: Cool
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed
- 8.7 EPA Pollution Category: Not listed
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 83.0271
- 9.3 Boiling Point at 1 atm: Decomposes 464°F = 240°C = 513.2°K
- 9.4 Freezing Point: 392°F = 200°C = 473.2°K
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 1.634 at room temperature
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Endothermic at infinite dilution (25°C) 34.7 Btu/lb = 19.3 cal/g = 8.07 X 10<sup>6</sup> J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES



# AMMONIUM HYPOPHOSPHITE

AHP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	100.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMMONIUM IODIDE

AID

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid White Odorless

Sinks and mixes with water.

Stop discharge if possible. Keep people away.  
Avoid contact with solid and dust; avoid inhalation.  
Isolate and remove discharged material.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
POISONOUS GASES MAY BE PRODUCED IN FIRE.  
Irritating gases may be produced when heated.  
Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).

### Exposure

CALL FOR MEDICAL AID.  
DUST  
Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.  
  
SOLID  
Irritating to skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{NH}_4\text{I}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 12027-06-4
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51481

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Contact with eyes causes irritation.
- 3.3 Treatment of Exposure: INHALATION: remove to fresh air. INGESTION: if significant amount has been ingested, get medical attention. EYES: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Not pertinent
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Toxic and irritating fumes of hydrogen iodide, iodine, and oxides of nitrogen may form in fire.
- 4.6 Behavior in Fire: Compound may sublime in fire and condense on cold surfaces.
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: NF; Reagent 99%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed
- 8.7 EPA Pollution Category: Not listed
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 144.94
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.56 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: 43 Btu/lb = 24 cal/g = 1.0 X 10<sup>3</sup> J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# AMMONIUM IODIDE

AID

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	155.000		N		N		N
36	156.000		O		O		O
38	157.099		T		T		T
40	158.099						
42	159.099		P		P		P
44	160.099		E		E		E
46	161.199		R		R		R
48	162.199		T		T		T
50	163.199		I		I		I
52	164.199		N		N		N
54	165.199		E		E		E
56	166.299		N		N		N
58	167.299		T		T		T
60	168.299						
62	169.299						
64	170.400						
66	171.400						
68	172.400						
70	173.400						
72	174.400						
74	175.500						
76	176.500						
78	177.500						
80	178.500						
82	179.599						
84	180.599						

# ALLYL ALCOHOL

ALA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Propen-1-ol Vinyl carbinol	Watery liquid      Colorless      Sharp mustard odor  Floats and mixes with water. Poisonous, flammable vapor is produced.
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Shut off ignition sources and call fire department. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes, nose and throat. Move to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 15; Substituted allyl  
 2.2 Formula:  $\text{CH}_2=\text{CHCH}_2\text{OH}$   
 2.3 IMO/UN Designation: 3.2/1098  
 2.4 DOT ID No.: 1098  
 2.5 CAS Registry No.: 107-18-6  
 2.6 NAERG Guide No.: 131  
 2.7 Standard Industrial Trade Classification: 51229

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister or air pack; rubber gloves, goggles; other protective equipment as required to prevent all body contact.
- 3.2 **Symptoms Following Exposure:** Vapors are quite irritating to eyes, nose, and throat. Eye irritation may be accompanied by complaints of photophobia and pain in the eyeball; pain may not begin until 6 hours after exposure. Liquid may cause first-and second-degree burns of the skin, with blister formation; underlying part will become swollen and painful, and local muscle spasms may occur.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from contaminated area and administer oxygen; get medical attention immediately. SKIN: remove liquid with soap and water. EYES: flush with continuous stream of water for 15 min.
- 3.4 TLV-TWA: 2 ppm (skin).  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: 4 ppm (skin).  
 3.7 Toxicity by Ingestion: Grade 3;  $\text{LD}_{50} = 50$  to 500 mg/kg (mouse, rat)  
 3.8 Toxicity by Inhalation: Currently not available.  
 3.9 Chronic Toxicity: Currently not available  
 3.10 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
 3.11 Liquid or Solid Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
 3.12 Odor Threshold: 0.78 ppm  
 3.13 IDLH Value: 20 ppm.  
 3.14 OSHA PEL-TWA: 2 ppm.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 90°F O.C. 72°F C.C.  
 4.2 Flammable Limits in Air: 2.5%-18%  
 4.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide  
 4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
 4.5 Special Hazards of Combustion Products: Toxic vapors are generated when heated  
 4.6 Behavior in Fire: Vapor heavier than air and may travel a considerable distance to a source of ignition and flash back  
 4.7 Auto Ignition Temperature: 829°F  
 4.8 Electrical Hazards: I, D  
 4.9 Burning Rate: 2.7 mm/min.  
 4.10 Adiabatic Flame Temperature: Currently not available  
 4.11 Stoichiometric Air to Fuel Ratio: Currently not available  
 4.12 Flame Temperature: Currently not available  
 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available  
 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
 5.2 Reactivity with Common Materials: No reaction  
 5.3 Stability During Transport: Stable at ordinary temperatures and pressures  
 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
 5.5 Polymerization: Not pertinent  
 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
 10 ppm"/threshold/fresh water  
 2.5 ppm"/bivalve larvae/lethal/salt water  
 \*Time period not specified.  
 6.2 Waterfowl Toxicity: Currently not available  
 6.3 Biological Oxygen Demand (BOD): 57%, 10 days; 20%, 5 days  
 6.4 Food Chain Concentration Potential: None noted  
 6.5 GESAMP Hazard Profile:  
 Bioaccumulation: 0  
 Damage to living resources: 3  
 Human Oral hazard: 2  
 Human Contact hazard: II  
 Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 98%  
 7.2 Storage Temperature: Ambient  
 7.3 Inert Atmosphere: No requirement  
 7.4 Venting: Pressure-vacuum  
 7.5 IMO Pollution Category: B  
 7.6 Ship Type: 2  
 7.7 Barge Hull Type: 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
 8.2 49 CFR Class: 6.1  
 8.3 49 CFR Package Group: I  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	3
Instability (Yellow).....	1

 8.6 EPA Reportable Quantity: 100  
 8.7 EPA Pollution Category: B  
 8.8 RCRA Waste Number: P005  
 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
 9.2 Molecular Weight: 58.08  
 9.3 Boiling Point at 1 atm: 206°F = 96.9°C = 370.1°K  
 9.4 Freezing Point: -200°F = -129°C = 144°K  
 9.5 Critical Temperature: 521.4°F = 271.9°C = 545.1°K  
 9.6 Critical Pressure: 840 psia = 57 atm = 5.8 MN/m<sup>2</sup>  
 9.7 Specific Gravity: 0.852 at 20°C (liquid)  
 9.8 Liquid Surface Tension: Not pertinent  
 9.9 Liquid Water Interfacial Tension: Not pertinent  
 9.10 Vapor (Gas) Specific Gravity: 2.0  
 9.11 Ratio of Specific Heats of Vapor (Gas): 1.12  
 9.12 Latent Heat of Vaporization: 295 Btu/lb = 164 cal/g = 6.87 X 10<sup>5</sup> J/kg  
 9.13 Heat of Combustion: -13,720 Btu/lb = -7620 cal/g = -319.0 X 10<sup>5</sup> J/kg  
 9.14 Heat of Decomposition: Not pertinent  
 9.15 Heat of Solution: (est.) Negligible  
 9.16 Heat of Polymerization: Not pertinent  
 9.17 Heat of Fusion: Currently not available  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: 1.0 psia

### NOTES

# ALLYL ALCOHOL

ALA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	54.220	0	0.414	77	1.123		N O T
40	54.090	10	0.425				P E R T I N E N T
45	53.950	20	0.437				
50	53.810	30	0.448				
55	53.670	40	0.459				
60	53.530	50	0.470				
65	53.390	60	0.481				
70	53.250	70	0.492				
75	53.110	80	0.503				
80	52.980	90	0.514				
85	52.840	100	0.525				
90	52.700	110	0.537				
95	52.560	120	0.548				
100	52.420	130	0.559				
		140	0.570				
		150	0.581				
		160	0.592				
		170	0.603				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	15	0.039	15	0.00045	0	0.298
	I	20	0.049	20	0.00056	10	0.302
	S	25	0.061	25	0.00069	20	0.307
	C	30	0.076	30	0.00084	30	0.311
	I	35	0.094	35	0.00103	40	0.315
	B	40	0.115	40	0.00125	50	0.319
	L	45	0.141	45	0.00152	60	0.323
	E	50	0.172	50	0.00183	70	0.327
		55	0.209	55	0.00220	80	0.331
		60	0.253	60	0.00264	90	0.336
		65	0.305	65	0.00315	100	0.340
		70	0.367	70	0.00375	110	0.344
		75	0.439	75	0.00444	120	0.348
		80	0.524	80	0.00525	130	0.352
		85	0.623	85	0.00619	140	0.356
		90	0.739	90	0.00727	150	0.360
		95	0.873	95	0.00852	160	0.365
		100	1.029	100	0.00995	170	0.369

# ALLYL CHLORIDE

ALC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 3-Chloropropene 3-Chloropropylene	Liquid Colorless to yellowish brown or red Sharp, irritating odor Floats on water. Flammable, irritating vapor is produced.
Avoid contact with liquid and vapor. Keep people away. Shut off ignition sources and call fire department. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b> VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Collection Systems: Skim  
 Chemical and Physical Treatment:  
 Neutralize; Absorb  
 Salvage waterfowl  
 Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 15; Substituted allyl  
 2.2 Formula:  $\text{CH}_2=\text{CHCH}_2\text{Cl}$   
 2.3 IMO/UN Designation: 3.1/1100  
 2.4 DOT ID No.: 1100  
 2.5 CAS Registry No.: 107-05-1  
 2.6 NAERG Guide No.: 131  
 2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Respiratory protection: (1 ppm to 2% for 1/2 hr or less) full face mask and canister; (greater concentration) self-contained breathing apparatus or its equivalent. Rubber or neoprene gloves, apron, boots; clean body-covering clothes; chemical goggles, gas-tight goggles, or equivalent; full face shield.  
 3.2 **Symptoms Following Exposure:** Causes marked irritation of skin and may burn. Burns the eyes; effect may be delayed.  
 3.3 **Treatment of Exposure:** INHALATION: if ill effects develop, move person to fresh air, keep him warm and quiet. Get medical attention immediately. Start artificial respiration if breathing stops. INGESTION: promptly induce vomiting. Get medical attention immediately; no known antidote; treat symptomatically. EYES: immediately flush with plenty of water for at least 30 min.; get medical attention promptly. SKIN: remove clothing and flush affected area thoroughly.  
 3.4 **TLV-TWA:** 1 ppm  
 3.5 **TLV-STEL:** 2 ppm.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50}$  = 0.5 to 5 g/kg (rat)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Lung, liver and kidney damage in experimental animals.  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.  
 3.12 **Odor Threshold:** > 1 ppm.  
 3.13 **IDLH Value:** 250 ppm.  
 3.14 **OSHA PEL-TWA:** 1 ppm.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** -20°F C.C.  
 4.2 **Flammable Limits in Air:** 3.3%-11.1%  
 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide, water spray  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.  
 4.5 **Special Hazards of Combustion Products:** Releases irritating hydrogen chloride gas on combustion  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 737°F  
 4.8 **Electrical Hazards:** I, D  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
 2.4 mg/l"/sheepshead minnow/LD50  
 19.8-24 mg/l"/fathead minnow/LD50  
 20.9 mg/l"/goldfish/LD50  
 \* No time given  
 48 ppm/96 hr/guppy/TL<sub>m</sub>/fresh water  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):**  
 BOD<sub>20</sub> or BOD<sub>28</sub>/ThOD = 10-40%;  
 BOD<sub>5</sub> = 0.23-0.45 p/p; ThOD = 1.67 p/p  
 6.4 **Food Chain Concentration Potential:** None noted  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 3  
 Human Oral hazard: 2  
 Human Contact hazard: II  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 97%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Pressure-vacuum  
 7.5 **IMO Pollution Category:** B  
 7.6 **Ship Type:** 2  
 7.7 **Barge Hull Type:** 1

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid  
 8.2 49 CFR Class: 3  
 8.3 49 CFR Package Group: I  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	1

 8.6 EPA Reportable Quantity: 1000  
 8.7 EPA Pollution Category: C  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 76.53  
 9.3 **Boiling Point at 1 atm:** 113°F = 45°C = 318°K  
 9.4 **Freezing Point:** -210.1°F = -134.5°C = 138.7°K  
 9.5 **Critical Temperature:** 465.8°F = 241°C = 514.2°K  
 9.6 **Critical Pressure:** 690 psia = 47 atm = 4.8 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.94 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 28.9 dynes/cm = 0.0289 N/m at 15°C  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** 2.6  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.124  
 9.12 **Latent Heat of Vaporization:** Currently not available  
 9.13 **Heat of Combustion:** -9749 Btu/lb = -5416 cal/g = -226.8 X 10<sup>3</sup> J/kg  
 9.14 **Heat of Decomposition:** Currently not available  
 9.15 **Heat of Solution:** Currently not available  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 10.3 psia

### NOTES

# ALLYL CHLORIDE

ALC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	61.620	16	0.310	30	1.040	52	0.358
5	61.390	18	0.310	35	1.040	54	0.354
10	61.170	20	0.310	40	1.040	56	0.350
15	60.940	22	0.310	45	1.040	58	0.346
20	60.720	24	0.310	50	1.040	60	0.342
25	60.490	26	0.310	55	1.040	62	0.338
30	60.270	28	0.310	60	1.040	64	0.334
35	60.040	30	0.310	65	1.040	66	0.331
40	59.820	32	0.310	70	1.040	68	0.327
45	59.590	34	0.310	75	1.040	70	0.324
50	59.360	36	0.310	80	1.040	72	0.320
55	59.140	38	0.310	85	1.040	74	0.317
60	58.910	40	0.310	90	1.040	76	0.313
65	58.690	42	0.310	95	1.040	78	0.310
70	58.460	44	0.310			80	0.307
75	58.240	46	0.310			82	0.304
80	58.010	48	0.310			84	0.300
85	57.790	50	0.310			86	0.297
90	57.560	52	0.310				
95	57.340	54	0.310				
100	57.110	56	0.310				
		58	0.310				
		60	0.310				
		62	0.310				
		64	0.310				
		66	0.310				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.330	35	2.514	35	0.03623	0	0.215
		40	2.861	40	0.04081	20	0.221
		45	3.246	45	0.04586	40	0.227
		50	3.675	50	0.05141	60	0.233
		55	4.150	55	0.05749	80	0.239
		60	4.676	60	0.06415	100	0.244
		65	5.257	65	0.07143	120	0.250
		70	5.896	70	0.07936	140	0.255
		75	6.600	75	0.08800	160	0.261
		80	7.371	80	0.09738	180	0.266
		85	8.216	85	0.10750	200	0.271
		90	9.140	90	0.11860	220	0.276
		95	10.150	95	0.13040	240	0.281
		100	11.250	100	0.14330	260	0.286
		105	12.440	105	0.15710	280	0.290
		110	13.740	110	0.17190	300	0.295
		115	15.150	115	0.18790	320	0.299
		120	16.670	120	0.20500	340	0.304
						360	0.308
						380	0.312
						400	0.316
						420	0.320
						440	0.324

# ALDRIN

ALD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4-endo-exo-5,8-dimethanonaphthalene. HHDN	Solid crystals, or solution Light to dark brown Mild chemical odor  Solid sinks in water; solution floats on water.
<p><b>AVOID CONTACT WITH LIQUID OR SOLID. KEEP PEOPLE AWAY.</b>  Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  Stop discharge if possible.  Call fire department if solution is discharged.  Isolate and remove discharged material.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	Solid is not flammable but usually is dissolved in a combustible liquid. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, dry chemical, foam or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.</p> <p>SOLID OR SOLUTION  POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.  Irritating to skin, eyes.  Remove contaminated clothing and shoes.  Flush affected areas with plenty of water.  IF IN EYES, hold eyelids open and flush with plenty of water.  IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>
<b>Water Pollution</b>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  May be dangerous if it enters water intakes.  Notify local health and wildlife officials.  Notify operators of nearby water intakes.</p>

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed  
2.2 **Formula:** C<sub>12</sub>H<sub>6</sub>Cl<sub>6</sub>  
2.3 **IMO/UN Designation:** 6.1/1542  
2.4 **DOT ID No.:** NA2761  
2.5 **CAS Registry No.:** 309-00-2  
2.6 **NAERG Guide No.:** 151  
2.7 **Standard Industrial Trade Classification:** 59110

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** During prolonged exposure to mixing and loading operations, wear clean synthetic rubber gloves and mask or respirator of the type passed by the U.S. Bureau of Mines for aldrin protection.
- 3.2 **Symptoms Following Exposure:** Ingestion, inhalation, or skin absorption of a toxic dose will induce nausea, vomiting, hyperexcitability, tremors, epileptiform convulsions, and ventricular fibrillation. Aldrin may cause temporary reversible kidney and liver injury. Symptoms may be seen after ingestion of less than 1 gram in an adult; ingestion of 25 mg has caused death in children.
- 3.3 **Treatment of Exposure:** SKIN CONTACT: wash with soap and running water. If material gets into eyes, wash immediately with running water for at least 15 minutes; get medical attention. INGESTION: call physician immediately; induce vomiting immediately. Repeat until vomit fluid is clear. Never give anything by mouth to an unconscious person. Keep patient prone and quiet. PHYSICIAN: administer barbituates as anti-convulsant therapy. Observe patient carefully because repeated treatment may be necessary.
- 3.4 **TLV-TWA:** 0.25 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> to 500 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Chronic exposure produces benign tumors in mice.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause slight smarting of the eyes or respiratory system if present in high concentrations. Effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening if the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 25 mg/m<sup>3</sup>.  
3.14 **OSHA PEL-TWA:** 0.25 mg/m<sup>3</sup>.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, foam or carbon dioxide for fires involving solutions of aldrin in hydrocarbon solvents.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion**  
Products: Irritating fumes of hydrochloric acid and chlorinated decomposition products are given off  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Not pertinent  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Not pertinent  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.130 ppm/24 hr/bluegill/LC<sub>50</sub>/fresh water  
0.05 ppm/24 hr/goldfish/LC<sub>50</sub>/fresh water  
0.01 ppm/24 hr/oyster/sublethal effect/salt water  
6.2 **Waterfowl Toxicity:** 520 mg/kg  
6.3 **Biological Oxygen Demand (BOD):** Not pertinent  
6.4 **Food Chain Concentration Potential:** High  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 20-95% aldrin, 5-80% inert ingredients. Several solutions in hydrocarbon solvents.  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**
- |                           |                |
|---------------------------|----------------|
| Category                  | Classification |
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 1  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** P004  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 364.93  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** 219°F = 104°C = 377°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.6 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ALDRIN

ALD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ALUMINUM FLUORIDE

ALF

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid powder or granules

White

Odorless

Sinks in water.

Avoid contact with dust; avoid inhalation.  
Notify local health and pollution control agencies.

### Fire

Not flammable.  
POISONOUS GASES MAY BE PRODUCED WHEN HEATED.  
Wear goggles and self-contained breathing apparatus.

### Exposure

DUST  
If inhaled, irritating to nose and throat.  
Move to fresh air.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Do not burn

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{AlF}_3$ ;  $\text{AlF}_6\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 7784-18-1
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52310

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles to protect against airborne particles and possibly respirator for intermittent heavy dust exposures.
- 3.2 **Symptoms Following Exposure:** ACUTE: respiratory irritation; possible nose bleeding or vomiting; CHRONIC: aggravates bronchitis/asthma; increased bone density.
- 3.3 **Treatment of Exposure:** For acute poisoning, oral administration of limewater, intravenous infusion of glucose, and intravenous injections of calcium gluconates.
- 3.4 **TLV-TWA:** 2.5 mg/m<sup>3</sup> (as F).
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** LD<sub>50</sub> = 600 mg/kg (guinea pig)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Skeletal fluorosis (bone abnormalities) in humans, working in aluminum plant for 12 years.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.
- 3.12 **Odor Threshold:** Not pertinent
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** When heated to sublimation condition, emits toxic fumes of fluoride
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 60 ppm\*/fish/lethal/fresh water \*Time period not specified.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Not pertinent
- 6.4 **Food Chain Concentration Potential:** None noted
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 90.7%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed
- 8.7 **EPA Pollution Category:** Not listed
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 83.98
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.88 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# ALUMINUM FLUORIDE

ALF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
78	0.500		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ALUMINUM SULFATE

ALM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Alum Cake aluminum Paper maker's alum Patent aluminum	Solid  Gray-white  Odorless  Sinks and mixes slowly with water.
<b>AVOID CONTACT WITH LIQUID AND VAPOR, KEEP PEOPLE AWAY.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER ON FIRE.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intake. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $Al_2(SO_4)_3 \cdot 18H_2O$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 10043-01-3
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust respirator; goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Inhalation of dust irritates nose and mouth. Ingestion of large doses causes gastric irritation, nausea, vomiting, and purging. Dust irritates eyes and skin.
- 3.3 Treatment of Exposure: INHALATION: rinse nose and mouth with water. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; oral mouse  $LD_{50} = 770$  mg/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Water
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: May corrode metals in presence of moisture
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Flush with water.
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 14ppm/36 hr/fundulus/fatal/fresh water  
240ppm/48 hr/mosquitofish/TL<sub>50</sub>/\*  
\*Water type not specified.
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 5000
- 8.7 EPA Pollution Category: D
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 666.4
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.7 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: -22.1 Btu/lb = -12.3 cal/g  
= 0.515 X 10<sup>3</sup> J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ALUMINUM SULFATE

ALM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	37.730		N O T		N O T		N O T
36	37.770						
38	37.800						
40	37.830						
42	37.870		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	37.900						
46	37.930						
48	37.970						
50	38.000						
52	38.030						
54	38.070						
56	38.100						
58	38.130						
60	38.170						
62	38.200						
64	38.230						
66	38.270						
68	38.300						
70	38.330						
72	38.370						
74	38.400						
76	38.430						
78	38.470						
80	38.500						
82	38.530						
84	38.570						

# ALUMINUM NITRATE

ALN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aluminum nitrate nonahydrate Nitric acid, aluminum salt	Solid  White  Odorless  Sinks and mixes slowly with water.
<b>Stop discharge if possible. Keep people away.</b> <b>Avoid contact with solid and dust.</b> <b>Isolate and remove discharged material.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $Al(NO_3)_3 \cdot 9H_2O$
- 2.3 IMO/UN Designation: 5.1/1438
- 2.4 DOT ID No.: 1438
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 140
- 2.7 Standard Industrial Trade Classification: 52359

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; dust respirator; rubber gloves
- 3.2 Symptoms Following Exposure: Ingestion of large doses causes gastric irritation, nausea, vomiting, and purging. Contact with dust irritates eyes and skin.
- 3.3 Treatment of Exposure: EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 3; oral rat  $LD_{50}$  = 264 mg/kg (nonahydrate)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire.
- 4.6 Behavior in Fire: May increase the intensity of fire when in contact with combustible material
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Dissolves and forms a weak solution of nitric acid. The reaction is not hazardous.
- 5.2 Reactivity with Common Materials: May corrode metals in presence of moisture
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Flush with water
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 0.07 ppm/10 days/stickleback/killed/ fresh water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent, 99+%; Technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer
- 8.2 49 CFR Class: 5.1
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed
- 8.7 EPA Pollution Category: Not listed
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 375.13
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: 163°F = 73°C = 346°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: >1 at 20°C(solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ALUMINUM NITRATE

ALN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	61.930		N		N		N
36	62.860		O		O		O
38	63.800		T		T		T
40	64.730						
42	65.660		P		P		P
44	66.599		E		E		E
46	67.530		R		R		R
48	68.459		T		T		T
50	69.400		I		I		I
52	70.330		N		N		N
54	71.259		E		E		E
56	72.200		N		N		N
58	73.129		E		E		E
60	74.059		N		N		N
62	75.000		T		T		T
64	75.929						
66	76.860						
68	77.799						
70	78.730						
72	79.660						
74	80.599						
76	81.530						
78	82.459						
80	83.400						
82	84.330						
84	85.259						

# AMMONIUM LAURYL SULFATE

ALS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dodecyl sulfate, ammonium salt Lauryl ammonium sulfate	Liquid Light yellow  May float or sink and mix with water.
Stop discharge if possible. Keep people away. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $C_{12}H_{25}OSO_2ONH_4 \cdot H_2O$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 68081969  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Rubber gloves; goggles or face shield  
3.2 Symptoms Following Exposure: Contact with liquid irritates eyes and may have drying effect on the skin. Prolonged contact will cause skin irritation.  
3.3 Treatment of Exposure: EYES OR SKIN: flush with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: LD50 (est) = <5 g/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent (non-combustible water solution)  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen and sulfur may form in fires.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Not pertinent  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Not pertinent  
4.13 Combustion Molar Ratio (Reactant to Product): Currently not available  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 28-30% solution in water  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed  
8.7 EPA Pollution Category: Not listed  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 283 (solute only)  
9.3 Boiling Point at 1 atm: Not pertinent  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.03 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES



# AMMONIUM LAURYL SULFATE

ALS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	64.290		N O T  P E R T I N E N T		N O T  P E R T I N E N T	77	900.000

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMMONIUM LACTATE

ALT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium lactate syrup DL-Lactic acid, ammonium salt	Solid or liquid	White	Odorless
Sinks and mixes with water.			
Stop discharge if possible. Keep people away. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water or foam.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula: CH3CH(OH)COONH4
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Contact with eyes causes irritation.
- 3.3 Treatment of Exposure: INHALATION: remove to fresh air. EYES: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not pertinent
- 4.3 Fire Extinguishing Agents: Water, foam
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may be formed in a fire.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Pure; 60% syrup in water
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed
- 8.7 EPA Pollution Category: Not listed
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 107.11
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.2 at 15°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# AMMONIUM LACTATE

ALT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMMONIA, ANHYDROUS

AMA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Liquid ammonia	Liquefied compressed gas Colorless Ammonia odor  Floats and boils on water. Poisonous, visible vapor cloud is produced.
Avoid contact with liquid and vapor. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop flow of gas or liquid if possible. Cool exposed containers and protect men effecting shutoff with water. Let fire burn.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Will cause frostbite. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Currently not available; Ammonia  
2.2 **Formula:** NH<sub>3</sub>  
2.3 **IMO/UN Designation:** /1005  
2.4 **DOT ID No.:** 1005  
2.5 **CAS Registry No.:** 7664-41-7  
2.6 **NAERG Guide No.:** 125  
2.7 **Standard Industrial Trade Classification:** 52261

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Gas-tight chemical goggles, self-contained breathing apparatus, rubber boots, rubber gloves, emergency shower and eye bath.
- 3.2 **Symptoms Following Exposure:** 700 ppm causes eye irritation, and permanent injury may result if prompt remedial measures are not taken; 5000 ppm can cause immediate death from spasm, inflammation, or edema of the larynx. Contact of the liquid with skin freezes the tissue and then produces a caustic burn.
- 3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air and give artificial respiration if necessary. Oxygen may be useful. Observe for laryngeal spasm and perform tracheostomy if indicated. SKIN OR EYES: flood immediately with running water for 15 min. Treat subsequently as thermal burn.
- 3.4 **TLV-TWA:** 25 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 35 ppm.  
3.7 **Toxicity by Ingestion:** Not pertinent  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Not pertinent
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe eye or throat irritation and may cause eye or lung injury; vapors cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** 46.8 ppm  
3.13 **IDLH Value:** 300 ppm.  
3.14 **OSHA PEL-TWA:** 50 ppm.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable under conditions likely to be encountered
- 4.2 **Flammable Limits in Air:** 15.50%-27.00%
- 4.3 **Fire Extinguishing Agents:** Stop flow of gas or liquid. Let fire burn.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** None
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 1204°F
- 4.8 **Electrical Hazards:** Class I, Group D
- 4.9 **Burning Rate:** 1 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 6.050 (Est.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves with mild heat effect
- 5.2 **Reactivity with Common Materials:** Corrosive to copper and galvanized surfaces.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
2.0 - 2.5 ppm/1-4 days/goldfish and yellow perch/LC<sub>50</sub>  
60 - 80 ppm/3 days/crayfish/LC<sub>50</sub>  
8.2 ppm/96 hr/fathead minnow/TL<sub>m</sub>
- 6.2 **Waterfowl Toxicity:** 120 ppm
- 6.3 **Biological Oxygen Demand (BOD):** Not pertinent
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, industrial, refrigeration, electronic, and metallurgical grades all have purity greater than 99.5%
- 7.2 **Storage Temperature:** Ambient for pressurized ammonia; low temperature for ammonia at atmospheric pressure
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief 250 psi for ammonia under pressure. Pressure-vacuum for ammonia at atmospheric pressure.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison gas
- 8.2 **49 CFR Class:** 2.3
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |

- 8.6 **EPA Reportable Quantity:** 100
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 17.03
- 9.3 **Boiling Point at 1 atm:** -28.1°F = -33.4°C = 239.8°K
- 9.4 **Freezing Point:** -108°F = -77.7°C = 265.5°K
- 9.5 **Critical Temperature:** 271.4°F = 133°C = 406.2°K
- 9.6 **Critical Pressure:** 1636 psia = 111.3 atm = 11.27 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.682 at -33.4°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 0.6
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.3 at 20°C
- 9.12 **Latent Heat of Vaporization:** 589 Btu/lb = 327 cal/g = 13.7 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -7992 Btu/lb = -4440 cal/g = -185.9 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -232 Btu/lb = -129 cal/g = -5.40 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 211.9 psia

### NOTES

# AMMONIA, ANHYDROUS

AMA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-105	42.070	-75	1.041		N		N
-100	42.200	-70	1.043		O		O
-95	42.310	-65	1.046		T		T
-90	42.410	-60	1.049				
-85	42.500	-55	1.052		P		P
-80	42.570	-50	1.054		E		E
-75	42.630	-45	1.057		R		R
-70	42.680	-40	1.060		T		T
-65	42.720	-35	1.063		I		I
-60	42.740	-30	1.066		N		N
-55	42.750				E		E
-50	42.750				N		N
-45	42.730				T		T
-40	42.700						
-35	42.660						
-30	42.600						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	-40	10.470	-40	0.03957	0	0.487
	I	-35	12.080	-35	0.04514	25	0.494
	S	-30	13.900	-30	0.05132	50	0.501
	C	-25	15.940	-25	0.05816	75	0.508
	I	-20	18.220	-20	0.06573	100	0.515
	B	-15	20.760	-15	0.07406	125	0.523
	L	-10	23.590	-10	0.08322	150	0.530
	E	-5	26.730	-5	0.09326	175	0.538
		0	30.210	0	0.10420	200	0.546
		5	34.040	5	0.11620	225	0.554
		10	38.270	10	0.12930	250	0.562
		15	42.920	15	0.14340	275	0.571
		20	48.020	20	0.15880	300	0.579
		25	53.600	25	0.17540	325	0.588
		30	59.690	30	0.19340	350	0.597
		35	66.330	35	0.21270	375	0.606
		40	73.549	40	0.23350	400	0.615
		45	81.400	45	0.25590	425	0.625
		50	89.900	50	0.27980	450	0.635
		55	99.099	55	0.30550	475	0.645
		60	109.000	60	0.33290	500	0.655
		65	119.700	65	0.36210	525	0.665
		70	131.299	70	0.39320	550	0.675
		75	143.699	75	0.42630	575	0.686
		80	157.000	80	0.46150	600	0.697
		85	171.199	85	0.49870		

# AMMONIUM MOLYBDATE

AMB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Molybdic acid (85%)	Solid  Colorless to greenish-yellow or white  Odorless  Sinks and mixes with water.
Stop discharge if possible. Keep people away. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$  (for CP and Reagent grades only)  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 13106-76-8; 12054-85-2  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; rubber gloves  
3.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Contact with eyes causes irritation.  
3.3 Treatment of Exposure: INHALATION: move to fresh air. EYES: flush with water for at least 15 min.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3; oral rat  $\text{LD}_{50}$  = 333 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Not pertinent  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Not pertinent  
4.13 Combustion Molar Ratio (Reactant to Product): Currently not available  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent; CP. A closely related substance is known as "molybdic acid 85%".  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed  
8.7 EPA Pollution Category: Not listed  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 123.6  
9.3 Boiling Point at 1 atm: Not pertinent; Decomposes at 190C  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.4 at 20°C (solid); 2.398  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# AMMONIUM MOLYBDATE

AMB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	43.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMMONIUM CHLORIDE

AMC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Amchlor Amchloride Ammoneric Ammonium muriate Sal ammoniac Salmiac	Solid  White  Odorless  Sinks and mixes slowly with water.
<b>Stop discharge if possible. Keep people away. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Irritating gases may be produced when heated. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{NH}_4\text{Cl}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 12125-02-9
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52321

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Gloves of any material; safety glasses or chemical safety goggles; dust mask or respirator as necessary
- 3.2 **Symptoms Following Exposure:** Inhalation of fumes irritates respiratory passages. Ingestion irritates mouth and stomach. Fumes are irritating to eyes. Contact with skin may cause irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air. INGESTION: give large amount of water; get medical attention if irritation persists. EYES OR SKIN: flush with plenty of water.
- 3.4 **TLV-TWA:** 10 mg/m<sup>3</sup> (fume).
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 20 mg/m<sup>3</sup> (fume).
- 3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 1,650 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Mild skin and respiratory system irritant
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating ammonia and hydrogen chloride gases may form in fire.
- 4.6 **Behavior in Fire:** May volatilize and condense on cool surfaces.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction; Releases Hydrogen Chloride
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
6 ppm/96 hr/sunfish TL<sub>m</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** USP; Reagent; Technical, 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification	
Health Hazard (Blue).....	1	2
Flammability (Red).....	0	0
Instability (Yellow).....	0	0
- 8.6 **EPA Reportable Quantity:** 5000
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 53.5
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.53 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 130 Btu/lb = 72 cal/g = 3.0 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# AMMONIUM CHLORIDE

AMC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	29.840		N O T		N O T		N O T
36	30.290						
38	30.730						
40	31.180						
42	31.620		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	32.070						
46	32.510						
48	32.950						
50	33.400						
52	33.840						
54	34.290						
56	34.730						
58	35.180						
60	35.620						
62	36.070						
64	36.510						
66	36.950						
68	37.400						
70	37.840						
72	38.290						
74	38.730						
76	39.180						
78	39.620						
80	40.070						
82	40.510						
84	40.950						

# AMMONIUM DICHROMATE

AMD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium bichromate	Solid crystals or powder  Orange to red  Odorless  Sinks and mixes with water.
<b>Fire</b>  FLAMMABLE. May cause fire on contact with combustibles. Containers may explode in fire. Combat fires from safe distance or protected location with unmanned hose holder or monitor nozzle. Flood discharge area with water. Cool exposed containers with water.	
<b>Exposure</b>	Call for medical aid. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$   
2.3 IMO/UN Designation: 5.1/1439  
2.4 DOT ID No.: 1439  
2.5 CAS Registry No.: 7789-09-5  
2.6 NAERG Guide No.: 141  
2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; protective goggles, gloves, clothing.  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation or ulceration of the mucous membranes of the nose, throat or respiratory tract. Respiratory irritation can produce symptoms resembling those of asthma. Continuing irritation of the nose may lead to perforation of the nasal septum. External contact can cause eye irritation and conjunctivitis, irritation and ulceration of skin wounds, and rash or external ulcers. If ingested, irritates mucous membrane and causes vomiting.  
3.3 **Treatment of Exposure:** INHALATION: remove to clean air and summon medical attention. EYES: immediately flush with water for at least 15 min. and consult a physician. SKIN: flush with water; if skin irritation develops, get medical attention. INGESTION: vomiting should occur; follow with an emetic of soapy water; give large amounts of water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Not pertinent  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Flammable solid  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Greenish chromic oxide smoke may cause irritation of lungs and mucous membranes.  
4.6 **Behavior in Fire:** Decomposes at about 180°C. Decomposition self-sustaining at about 225°C with spectacular swelling and evolution of heat and nitrogen, leaving chromic oxide residue. Pressure of confined gases can burst closed containers explosively.  
4.7 **Auto Ignition Temperature:** 437°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Can ignite combustible material such as wood shavings.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
136 ppm/96 hr/mosquito fish/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Analytical reagent grade: 99.0%; technical (photolitho) grade: technical granular grade: 99.7%; C.P. granular grade: 99.8%.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** None  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer  
8.2 49 CFR Class: 5.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	1
Special (White).....	OX

  
8.6 EPA Reportable Quantity: 10  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 252.06  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 2.15 at 25°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** 41 Btu/lb = 23 cal/g = 0.96 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# AMMONIUM DICHROMATE

AMD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	15.990		N O T		N O T		N O T
36	16.580						
38	17.160						
40	17.750						
42	18.340		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	18.930						
46	19.520						
48	20.110						
50	20.700						
52	21.290						
54	21.880						
56	22.460						
58	23.050						
60	23.640						
62	24.230						
64	24.820						
66	25.410						
68	26.000						
70	26.590						
72	27.180						
74	27.760						
76	28.350						
78	28.940						
80	29.530						
82	30.120						
84	30.710						

# AMMONIUM SULFITE

AMF

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Solid	White	Odorless
	Sinks and mixes slowly with water.		
Stop discharge if possible. Keep people away. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies.			
Fire	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.		
Exposure	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $(\text{NH}_4)_2\text{SO}_3 \cdot \text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 10196-04-0  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; rubber gloves  
3.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes.  
3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water; get medical attention. EYES: flush with water for 15 min. SKIN: flush with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Toxic sulfur dioxide and oxides of nitrogen may form in fires.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Not pertinent  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Not pertinent  
4.13 Combustion Molar Ratio (Reactant to Product): Currently not available  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Dilute with water. Do not attempt to neutralize with acids.  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 240 ppm/48 hr/mosquitofish/TL<sub>m</sub>/fresh water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Anhydrous; Purified monohydrate  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 5000  
8.7 EPA Pollution Category: D  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 134.2  
9.3 Boiling Point at 1 atm: Not pertinent  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: > 1.1 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: 20.5 Btu/lb = 11.4 cal/g = 0.477 X 10<sup>5</sup> J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# AMMONIUM SULFITE

AMF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	48.640		N		N		N
36	49.390		O		O		O
38	50.130		T		T		T
40	50.880						
42	51.620		P		P		P
44	52.370		E		E		E
46	53.110		R		R		R
48	53.850		T		T		T
50	54.600		I		I		I
52	55.340		N		N		N
54	56.090		E		E		E
56	56.830		N		N		N
58	57.580		E		E		E
60	58.320		N		N		N
62	59.070		T		T		T
64	59.810						
66	60.550						
68	61.300						
70	62.040						
72	62.790						
74	63.530						
76	64.280						
78	65.020						
80	65.770						
82	66.509						
84	67.250						

# AMMONIUM HYDROXIDE (<28% AQUEOUS AMMONIA)

AMH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonia solution Ammonia water Aqua ammonia Aqueous ammonia Household ammonia	Watery liquid      Colorless      Ammonia odor  Floats and mixes with water. Irritating vapor is produced.
Avoid contact with liquid and vapor. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Evacuate. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to skin, eyes, nose and throat. If inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness. Move to fresh air. IF IN EYES, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
<b>Water Pollution</b>	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 6; Ammonia  
2.2 Formula:  $\text{NH}_4\text{OH} \cdot \text{H}_2\text{O}$   
2.3 IMO/UN Designation: 2672  
2.4 DOT ID No.: 2672 (10-35%)  
2.5 CAS Registry No.: 1336-21-6  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber boots, gloves, apron, and coat; broad-brimmed rubber or felt hat; safety goggles. Use of protective oil will reduce skin irritation from ammonia.
- 3.2 **Symptoms Following Exposure:** Contact of liquid or vapor with skin, mucous membranes, lungs, or gastroenteric tract causes marked local irritation. Ingestion causes burning pain in mouth, throat, stomach, and thorax, constriction of throat, and coughing. This is soon followed by vomiting of blood or by passage of loose stools containing blood. Breathing difficulty, convulsions, and shock may result. Brief exposure to 5000 ppm or ingestion of 3-4 ml may be fatal.
- 3.3 **Treatment of Exposure:** INHALATION: give artificial respiration and oxygen if needed; enforce rest. INGESTION: do NOT induce vomiting; lavage stomach with water or lemon juice, milk, or demulcents; delay may cause perforation of esophagus or stomach; swelling of glottis may necessitate tracheostomy. EYES OR SKIN: wash with plenty of water.
- 3.4 **TLV-TWA:** 25 ppm as ammonia.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 35 ppm as ammonia.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral rat,  $\text{LD}_{50}$  = 350 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations intolerable. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** 50 ppm
- 3.13 **IDLH Value:** 300 ppm as ammonia.
- 3.14 **OSHA PEL-TWA:** 50 ppm as ammonia.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Mild liberation of heat
- 5.2 **Reactivity with Common Materials:**  
Corrosive to copper, copper alloys, aluminum alloys, galvanized surfaces
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
6.25 ppm/24 hr/trout/lethal/fresh water  
15 ppm/48 hr/sunfish/TL<sub>50</sub>/Phila. tap water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Grade A: 29.4%  $\text{NH}_3$ ; B: 25%; C: 15%. USP: 27 to 29%. CP: 28%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 1000
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.89 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent; 0.60
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# AMMONIUM HYDROXIDE (<28% AQUEOUS AMMONIA)

AMH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
10	56.640	34	1.000		N O T		N O T
15	56.530	36	1.000				
20	56.430	38	1.000				
25	56.330	40	1.000				
30	56.220	42	1.000		P		P
35	56.120	44	1.000		E		E
40	56.010	46	1.000		R		R
45	55.910	48	1.000		T		T
50	55.810	50	1.000		I		I
55	55.700	52	1.000		N		N
60	55.600	54	1.000		E		E
65	55.490	56	1.000		N		N
70	55.390	58	1.000		T		T
75	55.290	60	1.000				
80	55.180	62	1.000				
85	55.080	64	1.000				
		66	1.000				
		68	1.000				
		70	1.000				
		72	1.000				
		74	1.000				
		76	1.000				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		C U R R E N T L Y		C U R R E N T L Y		N O T
			N O T		N O T		P E R T I N E N T
			A V A I L A B L E		A V A I L A B L E		

# N-AMYL METHYL KETONE

AMK

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Heptanone 2-Ketoheptane Methyl amyl ketone Methyl pentyl ketone Pentyl methyl ketone	Liquid  White  Penetrating fruity odor  Floats and mixes slowly with water.
Stop discharge if possible. Keep people away. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, headache, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{COCH}_3$   
2.3 IMO/UN Designation: 3.3/1110  
2.4 DOT ID No.: 1110  
2.5 CAS Registry No.: 110-43-0  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Gloves and goggles  
3.2 **Symptoms Following Exposure:** Inhalation of concentrated vapor may have narcotic effect. Ingestion causes gastrointestinal disturbances. Contact with eyes causes irritation. Prolonged and repeated contact with skin may cause defatting with resultant irritation.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: get medical attention. EYES: flush with water for 15 to 20 min. SKIN: flush affected areas with water.  
3.4 **TLV-TWA:** 50 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50}$  = 1,670 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** 0.897 ppb; 49 ppb  
3.13 **IDLH Value:** 800 ppm.  
3.14 **OSHA PEL-TWA:** 100 ppm.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 117°F O.C. 102°F C.C.  
4.2 **Flammable Limits in Air:** 1.11%-7.9%  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 740°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Will attack some forms of plastic.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0.5 lb/lb, 10 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; Pure  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Ventilated (natural)  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed  
8.7 **EPA Pollution Category:** Not listed  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 114.19  
9.3 **Boiling Point at 1 atm:** 304.7°F = 151.5°C = 424.7°K  
9.4 **Freezing Point:** -31°F = -35°C = 238°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.8204 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** 26.17 dynes/cm = 0.02617 N/m at 25°C  
9.9 **Liquid Water Interfacial Tension:** 12.4 dynes/cm = 0.0124 N/m at 25°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.94  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.051  
9.12 **Latent Heat of Vaporization:** 148.9 Btu/lb = 82.7 cal/g = 3.46 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# N-AMYL METHYL KETONE

AMK

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
30	52.020	51	0.450	30	0.995	51	0.895
35	51.870	52	0.450	40	0.985	52	0.889
40	51.730	53	0.450	50	0.976	53	0.883
45	51.580	54	0.450	60	0.967	54	0.878
50	51.430	55	0.450	70	0.958	55	0.872
55	51.290	56	0.450	80	0.949	56	0.866
60	51.140	57	0.450	90	0.940	57	0.861
65	50.990	58	0.450	100	0.931	58	0.856
70	50.840	59	0.450	110	0.922	59	0.850
75	50.690	60	0.450	120	0.912	60	0.845
80	50.540	61	0.450	130	0.903	61	0.840
85	50.390	62	0.450	140	0.894	62	0.835
90	50.240	63	0.450	150	0.885	63	0.829
95	50.100	64	0.450	160	0.876	64	0.824
		65	0.450	170	0.867	65	0.819
		66	0.450	180	0.858	66	0.814
		67	0.450	190	0.848	67	0.809
		68	0.450	200	0.839	68	0.805
				210	0.830	69	0.800
				220	0.821	70	0.795
				230	0.812	71	0.790
				240	0.803	72	0.786
				250	0.794	73	0.781
				260	0.785	74	0.776
						75	0.772
						76	0.767

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.430	70	0.072	70	0.00144	0	0.323
36	0.430	80	0.099	80	0.00194	20	0.333
38	0.430	90	0.134	90	0.00260	40	0.344
40	0.430	100	0.181	100	0.00344	60	0.354
42	0.430	110	0.242	110	0.00451	80	0.365
44	0.430	120	0.319	120	0.00586	100	0.375
46	0.430	130	0.418	130	0.00753	120	0.385
48	0.430	140	0.541	140	0.00960	140	0.395
50	0.430	150	0.696	150	0.01215	160	0.404
52	0.430	160	0.888	160	0.01524	180	0.414
54	0.430	170	1.123	170	0.01898	200	0.423
56	0.430	180	1.411	180	0.02346	220	0.433
58	0.430	190	1.760	190	0.02882	240	0.442
60	0.430	200	2.181	200	0.03516	260	0.451
62	0.430	210	2.684	210	0.04264	280	0.460
64	0.430	220	3.285	220	0.05141	300	0.469
66	0.430	230	3.995	230	0.06163	320	0.477
68	0.430	240	4.833	240	0.07348	340	0.486
70	0.430	250	5.815	250	0.08716	360	0.494
72	0.430	260	6.960	260	0.10290	380	0.503
74	0.430	270	8.290	270	0.12090	400	0.511
76	0.430	280	9.828	280	0.14130	420	0.519
78	0.430	290	11.600	290	0.16460	440	0.527
80	0.430	300	13.630	300	0.19080		
82	0.430	310	15.940	310	0.22040		
84	0.430	320	18.580	320	0.25350		

# N-AMYL MERCAPTAN

AMM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Amyl hydrosulfide Amyl sulphydrate Amyl thioalcohol 1-Pentanethiol	Liquid                      Colorless to yellow                      Strong garlic odor  Floats on water. Flammable vapor is produced.
Shut off ignition sources. Call fire department. Stop discharge if possible. Keep people away. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Containers may explode in fire. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Move victim to fresh air.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Clean shore line  
Salvage waterfowl  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{SH}$
- 2.3 IMO/UN Designation: 3.2/1111
- 2.4 DOT ID No.: 1111
- 2.5 CAS Registry No.: 110-66-7
- 2.6 NAERG Guide No.: 130
- 2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Plastic gloves; goggles.
- 3.2 Symptoms Following Exposure: Inhalation may cause nausea because of offensive odor. Contact with eyes or skin causes slight irritation. Ingestion may cause vomiting.
- 3.3 Treatment of Exposure: INHALATION: remove to fresh air; apply artificial respiration if required. EYES: wash with water; see a physician. SKIN: wash with soap and water, INGESTION: induce vomiting if it does not occur spontaneously.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: None
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: 0.3 mg/m<sup>3</sup>
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 65°F O.C.
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective
- 4.5 Special Hazards of Combustion Products: Sulfur dioxide gas is formed
- 4.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: 4.7 mm/min.
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Currently not available
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 96.0+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Pressure-vacuum
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid
- 8.2 49 CFR Class: 3
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: Yes
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed
- 8.7 EPA Pollution Category: Not listed
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 104.2
- 9.3 Boiling Point at 1 atm: 248°F = 120°C = 393°K
- 9.4 Freezing Point: -105°F = -76°C = 197°K
- 9.5 Critical Temperature: 609.8°F = 321°C = 594.2°K
- 9.6 Critical Pressure: 508 psia = 34.5 atm = 3.50 MN/m<sup>2</sup>
- 9.7 Specific Gravity: 0.8392 at 25°C (liquid)
- 9.8 Liquid Surface Tension: 26.8 dynes/cm = 0.0268 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension: (est.) 35 dynes/cm = 0.035 N/m at 20°C
- 9.10 Vapor (Gas) Specific Gravity: 3.59
- 9.11 Ratio of Specific Heats of Vapor (Gas): 1.0622
- 9.12 Latent Heat of Vaporization: -171 Btu/lb = -94.9 cal/g = -3.97 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: -17,070 Btu/lb = -9,480 cal/g = -397 X 10<sup>6</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# N-AMYL MERCAPTAN

AMM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
65	52.590	34	0.436	34	1.048	72	0.661
70	52.440	36	0.437	36	1.048	74	0.653
75	52.300	38	0.438	38	1.048	76	0.644
80	52.150	40	0.439	40	1.048	78	0.636
85	52.000	42	0.441	42	1.048	80	0.628
90	51.840	44	0.442	44	1.048	82	0.620
95	51.690	46	0.443	46	1.048	84	0.612
100	51.540	48	0.444	48	1.048	86	0.605
105	51.390	50	0.445	50	1.048	88	0.597
110	51.230	52	0.446	52	1.048	90	0.590
115	51.070	54	0.447	54	1.048	92	0.583
120	50.920	56	0.448	56	1.048	94	0.576
125	50.760	58	0.449	58	1.048	96	0.569
		60	0.451	60	1.048	98	0.562
		62	0.452	62	1.048	100	0.555
		64	0.453	64	1.048	102	0.549
		66	0.454	66	1.048	104	0.542
		68	0.455	68	1.048	106	0.536
		70	0.456			108	0.530
		72	0.457			110	0.524
		74	0.458			112	0.518
		76	0.459			114	0.512
		78	0.461			116	0.507
		80	0.462			118	0.501
		82	0.463			120	0.495
		84	0.464			122	0.490

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	40	0.078	40	0.00152	0	0.325
	N	50	0.111	50	0.00211	10	0.325
	S	60	0.155	60	0.00289	20	0.325
	O	70	0.214	70	0.00392	30	0.325
	L	80	0.292	80	0.00526	40	0.325
	U	90	0.395	90	0.00697	50	0.325
	B	100	0.527	100	0.00914	60	0.325
	I	110	0.697	110	0.01188	70	0.325
	E	120	0.913	120	0.01528	80	0.325
		130	1.184	130	0.01949	90	0.325
		140	1.523	140	0.02466	100	0.325
		150	1.943	150	0.03094	110	0.325
		160	2.460	160	0.03853	120	0.325
		170	3.090	170	0.04764	130	0.325
		180	3.854	180	0.05849	140	0.325
		190	4.775	190	0.07134	150	0.325
		200	5.877	200	0.08648	160	0.325
		210	7.189	210	0.10420	170	0.325
		220	8.742	220	0.12490		
		230	10.570	230	0.14880		
		240	12.710	240	0.17640		

# AMMONIUM NITRATE

AMN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nitram	Solid pellets or flakes White to light gray or brown  Odorless  Sinks and mixes with water.
Call Fire department. Keep people away. Evacuate area in case of large discharge. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	May cause fire and explode on contact with combustibles. CONTAINERS MAY EXPLODE IN FIRE. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Wear self-contained breathing apparatus. Evacuate surrounding area. Combat fires from protected location with unmanned hose holder or monitor nozzle. Flood discharge area with water. Cool exposed containers with water. Continue cooling after fire has been extinguished.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose, and throat. If inhaled, may cause coughing or difficult breathing. Move to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Currently not available; Ammonia  
2.2 **Formula:**  $\text{NH}_4\text{NO}_3$   
2.3 **IMO/UN Designation:** 5.1/2067  
2.4 **DOT ID No.:** 1942  
2.5 **CAS Registry No.:** 6484-52-2  
2.6 **NAERG Guide No.:** 140  
2.7 **Standard Industrial Trade Classification:** 51481

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained breathing apparatus  
3.2 **Symptoms Following Exposure:** Irritation of eyes and mucous membranes. Absorption via ingestion or inhalation causes urination and acid urine. Large amount causes systemic acidosis and methemoglobinemia (abnormal hemoglobin).  
3.3 **Treatment of Exposure:** Remove from exposure-symptoms reversible.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** None  
3.12 **Odor Threshold:** Not pertinent  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Use flooding amounts of water in early stages of fire. When large quantities are involved in massive fires, control efforts should be confined to protecting from explosion.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Decomposes, giving off extremely toxic oxides of nitrogen.  
4.6 **Behavior in Fire:** May explode in fires. Supports combustion of common organic fuels.  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Not pertinent  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Not pertinent  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** If heated strongly, decomposes, giving off toxic gases and gases which support combustion. Undergoes detonation if heated under confinement.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure grade; fertilizer grade (33.5% nitrogen)  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer  
8.2 **49 CFR Class:** 5.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	0
Instability (Yellow).....	3
Special (White).....	OX

  
8.6 **EPA Reportable Quantity:** Not listed  
8.7 **EPA Pollution Category:** Not listed  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 80.05  
9.3 **Boiling Point at 1 atm:** Not pertinent; 230-278°F  
9.4 **Freezing Point:** 337.8°F = 169.9°C = 443.1°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.72 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# AMMONIUM NITRATE

AMN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	122.200		N		N		N
36	126.500		O		O		O
38	130.799		T		T		T
40	135.000						
42	139.299		P		P		P
44	143.599		E		E		E
46	147.799		R		R		R
48	152.099		T		T		T
50	156.400		I		I		I
52	160.599		N		N		N
54	164.900		E		E		E
56	169.199		N		N		N
58	173.400		E		E		E
60	177.699		N		N		N
62	182.000		T		T		T
64	186.199						
66	190.500						
68	194.799						
70	199.000						
72	203.299						
74	207.599						
76	211.799						
78	216.099						
80	220.400						
82	224.599						
84	228.900						

# AMMONIUM PERCHLORATE

AMP

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid crystals      White      Odorless

Sinks and mixes with water.

Wear goggles and self-contained breathing apparatus.  
Keep people away.  
Isolate and remove discharged material.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

May cause fire and explode on contact with combustibles.  
CONTAINERS MAY EXPLODE IN FIRE.  
POISONOUS GASES MAY BE PRODUCED IN FIRE.  
Wear goggles and self-contained breathing apparatus.  
Evacuate surrounding area.  
Combat large fires from protected location with unmanned hose holder or monitor nozzle.

### Exposure

CALL FOR MEDICAL AID.

SOLID  
Irritating to eyes and skin.  
Harmful if swallowed.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $\text{NH}_4\text{ClO}_4$   
2.3 IMO/UN Designation: 5.1/1442  
2.4 DOT ID No.: 1442  
2.5 CAS Registry No.: 7790-98-9  
2.6 NAERG Guide No.: 143  
2.7 Standard Industrial Trade Classification: 51481

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Currently not available  
3.2 Symptoms Following Exposure: Irritating to skin and mucous membranes.  
3.3 Treatment of Exposure: Currently not available  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; oral rat  $\text{LD}_{50}$  = 3500 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Not pertinent  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Not pertinent  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Water flooding (from protected location)  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Toxic gases are produced in a fire.  
4.6 Behavior in Fire: May explode when involved in fire or exposed to shock or friction.  
4.7 Auto Ignition Temperature: Decomposes at 464°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not flammable  
4.10 Adiabatic Flame Temperature: Not pertinent  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Not pertinent  
4.13 Combustion Molar Ratio (Reactant to Product): Currently not available  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: If contaminated with carbonaceous materials, can become an explosive which is sensitive to shock and friction. Readily detonates or explodes.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer  
8.2 49 CFR Class: 5.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 4              |
| Special (White).....      | OX             |
- 8.6 EPA Reportable Quantity: Not listed  
8.7 EPA Pollution Category: Not listed  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 117.49  
9.3 Boiling Point at 1 atm: Not pertinent  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.95 at 15°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# AMMONIUM PERCHLORATE

AMP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	12.560		N		N		N
36	13.130		O		O		O
38	13.690		T		T		T
40	14.260						
42	14.830		P		P		P
44	15.390		E		E		E
46	15.960		R		R		R
48	16.530		T		T		T
50	17.090		I		I		I
52	17.660		N		N		N
54	18.230		E		E		E
56	18.790		N		N		N
58	19.360		E		E		E
60	19.930		N		N		N
62	20.490		T		T		T
64	21.060						
66	21.630						
68	22.190						
70	22.760						
72	23.330						
74	23.890						
76	24.460						
78	25.030						
80	25.590						
82	26.160						
84	26.730						

# AMMONIUM STEARATE

AMR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium stearate dispersion Soap Stearic acid, ammonium salt	Solid paste or liquid      White to yellow      Weak ammonia odor  May float or sink in water.
Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and solid. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible solid. Solution not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $C_{17}H_{35}COONH_4$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 1002-89-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Gloves and goggles  
3.2 Symptoms Following Exposure: None experienced under normal conditions of use. Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation.  
3.3 Treatment of Exposure: INHALATION or INGESTION: no treatment required. EYES: flush with copious quantities of tap water. SKIN: flush with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:  $> 140^{\circ}\text{F}$  C.C. (pure material only; solution not flammable)  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Toxic ammonia and oxides of nitrogen may form in fires.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Currently not available  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Currently not available  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 33% dispersion in water; technical paste  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed  
8.7 EPA Pollution Category: Not listed  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at  $15^{\circ}\text{C}$  and 1 atm: Solid or liquid  
9.2 Molecular Weight: 301.5  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.01 at  $20^{\circ}\text{C}$  (liquid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES



# AMMONIUM STEARATE

AMR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	63.050		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMMONIUM SULFATE

AMS

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid White Odorless

Sinks and mixes with water.

Isolate and remove discharged material.  
Notify local health and pollution control agencies.

### Fire

Not flammable.

### Exposure

Not harmful.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $(\text{NH}_4)_2\text{SO}_4$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 7783-20-2
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51481

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Currently not available
- 3.2 Symptoms Following Exposure: Currently not available
- 3.3 Treatment of Exposure: Currently not available
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 3;  $\text{LD}_{50} = 58 \text{ mg/kg (rat)}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Not pertinent
- 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent
- 3.11 Liquid or Solid Characteristics: Not pertinent
- 3.12 Odor Threshold: Not pertinent
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not flammable
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not flammable
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
1290 ppm/96 hr/mosquitofish/fresh water/ $\text{TL}_{m1}$   
292 ppm/96 hr/Daphnia magna/fresh water/ $\text{TL}_{m1}$
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available
- 7.2 Storage Temperature: Currently not available
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	0 3
Flammability (Red).....	0 0
Instability (Yellow).....	0 0
- 8.6 EPA Reportable Quantity: Not listed
- 8.7 EPA Pollution Category: Not listed
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 132.14
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.78 at 15° C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

NOTES

# AMMONIUM SULFATE

AMS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	50.780		N		N		N
36	51.960		O		O		O
38	53.150		T		T		T
40	54.340						
42	55.530		P		P		P
44	56.720		E		E		E
46	57.910		R		R		R
48	59.100		T		T		T
50	60.290		I		I		I
52	61.480		N		N		N
54	62.660		E		E		E
56	63.850		N		N		N
58	65.040		E		E		E
60	66.230		N		N		N
62	67.419		T		T		T
64	68.610						
66	69.799						
68	70.990						
70	72.179						
72	73.360						
74	74.549						
76	75.740						
78	76.929						
80	78.120						
82	79.309						
84	80.500						

# AMMONIUM THIOCYANATE

AMT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium rhodanide Ammonium rhodanide Ammonium sulfocyanate Ammonium sulfocyanide Thiocyanic acid, ammonium salt	Solid or solution (in water)      White      Odorless  Sinks and mixes with water.
<b>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and solid. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible Solid. Solution not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR OR DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula: NH<sub>4</sub>SCN
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 1762-95-4
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber or plastic gloves; rubber or plastic apron; standard goggles
- 3.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes dizziness, cramps, nervous disturbances. Dust irritates eyes. Can be absorbed through skin; prolonged contact may produce various skin eruptions, dizziness, cramps, nausea, and mild to severe disturbance of the nervous system.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water; get medical attention. EYES OR SKIN: wash with water; consult physician.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 854 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Solid may be combustible; solution is not flammable.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Decomposes to form ammonia, hydrogen sulfide, and hydrogen cyanide. Oxides of nitrogen may also form. All of these products are toxic.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
280-300 ppm/1 hr/orange-spotted sunfish/killed/fresh water  
420 ppm/48 hr/mosquitofish/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** < 0.010 lb/lb, 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent; Technical, 50-65% solution in water
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 5000
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid or liquid
- 9.2 **Molecular Weight:** 76.12
- 9.3 **Boiling Point at 1 atm:** (solution; solid decomposes) 239°F = 115°C = 388°K
- 9.4 **Freezing Point:** (solid) 320°F = 160°C = 433°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** > 1.1 at 20°C (solid) 1.1-1.15 at 20°C (solution)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 133 Btu/lb = 74 cal/g = 3.1 X 10<sup>6</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# AMMONIUM THIOCYANATE

AMT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	111.200		N		N		N
36	114.500		O		O		O
38	117.799		T		T		T
40	121.000						
42	124.299		P		P		P
44	127.500		E		E		E
46	130.799		R		R		R
48	134.000		T		T		T
50	137.299		I		I		I
52	140.500		N		N		N
54	143.799		E		E		E
56	147.099		N		N		N
58	150.299		E		E		E
60	153.599		N		N		N
62	156.799		T		T		T
64	160.099						
66	163.299						
68	166.599						
70	169.799						
72	173.099						
74	176.400						
76	179.599						
78	182.900						
80	186.099						
82	189.400						
84	192.599						

# N-AMYL CHLORIDE

AMY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Amyl chloride n-Butylcarbiny chloride Chloride of amyl 1-Chloropentane 1-Pentyl chloride	Liquid  Colorless to purple  Pleasant odor  Floats on water. Flammable vapor is produced.
<b>Fire</b>  Shut off ignition sources. Call fire department. Stop discharge if possible. Keep people away. Evacuate area in case of large discharge. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Exposure</b>	<b>FLAMMABLE:</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Irritating gases may be produced when heated. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.  <b>LIQUID</b> Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.  <b>Water Pollution</b> Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Clean shore line  
Salvage waterfowl  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$   
2.3 IMO/UN Designation: 3.2/1107  
2.4 DOT ID No.: 1107  
2.5 CAS Registry No.: 543-59-9  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Inhalation causes mild irritation of mucous membranes. Ingestion of liquid or contact with skin or eyes causes mild irritation.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; apply artificial respiration if required. EYES: flush with water. SKIN: wash well with soap and water. INGESTION: induce vomiting; give water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1;  $\text{LD}_{50}$  = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 55°F O.C. 34°F C.C.  
4.2 **Flammable Limits in Air:** 1.4%-8.6%  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride and toxic phosgene may be formed in fires.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 500°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 4.9 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed  
8.7 **EPA Pollution Category:** Not listed  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 106.6  
9.3 **Boiling Point at 1 atm:** 226°F = 108°C = 381°K  
9.4 **Freezing Point:** -146°F = -99°C = 174°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.8834 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 24.9 dynes/cm = 0.0249 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 35 dynes/cm = 0.035 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.7  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0650  
9.12 **Latent Heat of Vaporization:** 132.1 Btu/lb = 73.40 cal/g =  $3.073 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -13,500 Btu/lb = -7,500 cal/g =  $-314 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N-AMYL CHLORIDE

AMY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	56.200	34	0.391	35	0.811	32	1.037
40	56.030	36	0.392	40	0.811	34	1.005
45	55.850	38	0.393	45	0.811	36	0.974
50	55.680	40	0.394	50	0.811	38	0.945
55	55.510	42	0.396	55	0.811	40	0.916
60	55.330	44	0.397	60	0.811	42	0.889
65	55.160	46	0.398	65	0.811	44	0.863
70	54.990	48	0.399	70	0.811	46	0.838
75	54.810	50	0.400	75	0.811	48	0.813
80	54.640	52	0.401	80	0.811	50	0.790
85	54.470	54	0.402	85	0.811	52	0.767
90	54.290	56	0.403	90	0.811	54	0.746
95	54.120	58	0.404	95	0.811	56	0.725
100	53.950	60	0.406	100	0.811	58	0.704
		62	0.407			60	0.685
		64	0.408			62	0.666
		66	0.409			64	0.648
		68	0.410			66	0.630
						68	0.613
						70	0.597
						72	0.581
						74	0.566
						76	0.551
						78	0.537
						80	0.523

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	80	0.654	80	0.01204	100	0.318
	N	90	0.864	90	0.01560	120	0.326
	S	100	1.126	100	0.01998	140	0.334
	O	110	1.452	110	0.02531	160	0.342
	L	120	1.852	120	0.03173	180	0.349
	U	130	2.340	130	0.03940	200	0.357
	B	140	2.928	140	0.04849	220	0.364
	L	150	3.632	150	0.05916	240	0.371
	E	160	4.469	160	0.07161	260	0.379
		170	5.455	170	0.08603	280	0.386
		180	6.611	180	0.10260	300	0.393
		190	7.955	190	0.12160	320	0.400
		200	9.510	200	0.14320	340	0.406
		210	11.300	210	0.16750	360	0.413
		220	13.340	220	0.19490	380	0.420
		230	15.670	230	0.22560	400	0.426
		240	18.300	240	0.25980	420	0.433
		250	21.270	250	0.29760	440	0.439
		260	24.600	260	0.33950		
		270	28.320	270	0.38550		
		280	32.460	280	0.43580		

# AMMONIUM BROMIDE

ANB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hydrobromic acid monoammoniate	Solid crystals or granules	White (becomes yellow in air)	Odorless
Sinks and mixes in water.			
Wear goggles and dust mask. Stop discharge if possible. Keep people away. Isolate and remove discharged material. Notify local health and pollution control agencies.			
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE OR WHEN HEATED. In fire conditions wear self-contained breathing apparatus, and goggles. Water spray will reduce fume and irritant gases.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Dust irritating if breathed. Slightly irritating to skin and eyes. Harmful if swallowed. Move to fresh air. Flush affected areas with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, induce vomiting.		
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed 2.2 Formula: NH <sub>4</sub> Br 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 12124-97-9 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51481
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> In fire conditions wear self-contained breathing apparatus, wear goggles if eye protection not provided. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Dust irritating - disturbed behavior, sedation. EYES: Slight irritation. SKIN: Slight irritation only with repeated or prolonged contact. INGESTION: Weakness, nervousness, anorexia, confusion, hallucinations, drowsiness, irritability, ataxia, vertigo, skin rash. 3.3 <b>Treatment of Exposure:</b> EYES AND SKIN: Flush with large amounts of water. INGESTION: Induce vomiting and call a doctor. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2: LD <sub>50</sub> = 0.5 to 5 g/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Chronic bromide intoxication. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Not pertinent 3.11 <b>Liquid or Solid Characteristics:</b> No appreciable hazard. Practically harmless to skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Water spray
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
**Products:** Material decomposes into N<sub>2</sub> and HBr or Br<sub>2</sub> under extreme temperatures.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** At fire temperatures may corrode metal
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99% to 99.5%
- 7.2 **Storage Temperature:** Cool
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1 2            |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |

1(nonfire), 2 (fire)

- 8.6 **EPA Reportable Quantity:** Not listed
- 8.7 **EPA Pollution Category:** Not listed
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 97.95
- 9.3 **Boiling Point at 1 atm:** Sublimes 1007°F = 541.7°C = 814.8°K
- 9.4 **Freezing Point:** Sublimes without melting
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.429 at room temperature
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Endothermic infinite dilution 76.0 Btu/lb = 42.2 cal/g = 1.77 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# AMMONIUM BROMIDE

ANB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
40	61.969		C		N		N
50	66.690		U		O		O
60	71.412		R		T		T
70	76.134		R		P		P
80	80.855		E		E		E
90	85.577		N		R		R
100	90.297		T		T		T
110	95.020		L		I		I
120	99.740		L		N		N
130	104.462		Y		E		E
140	109.183		N		N		N
150	113.905		O		T		T
160	118.627		T				
170	123.349		A				
180	128.070		V				
190	132.792		A				
200	137.514		I				
210	142.234		L				
			A				
			V				
			A				
			I				
			L				
			A				
			B				
			L				
			E				

# ISO-AMYL NITRITE

ANI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Amyl nitrite Isopentyl nitrite 3-Methylbutyl nitrite	Liquid                      Colorless to light yellow                      Pleasant fruity odor  Floats on water.    Poisonous gas is produced on contact with water.
<p>Shut off ignition sources.    Call fire department.  Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).  Avoid contact with liquid.    Keep people away.  Stop discharge if possible.  Evacuate.  Isolate and remove discharged material.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. DO NOT USE WATER ON FIRE. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause dizziness, headache or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Skim  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>CHCH<sub>2</sub>CH<sub>2</sub>ONO  
2.3 IMO/UN Designation: 3.1/1113  
2.4 DOT ID No.: 1113  
2.5 CAS Registry No.: 463-04-7  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51489

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective goggles or face shield; self-contained breathing apparatus; protective gloves and clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes flushing of the face, pulsatile headache, disturbing tachycardia, cyanosis (methemoglobinemia), weakness, confusion, restlessness, faintness, and collapse. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION or INGESTION: place patient in recumbent position; if necessary, administer oxygen. For treatment of severe methemoglobinemia, transfuse with whole blood or give I.V. or I.M. a dose of 1-2 mg/kg methylene blue or an oral dose of 3-5 mg/kg. EYES: after contact with liquid, irrigate with large quantities of water for 15 min.; call physician. SKIN: after contact with liquid, wash with large amounts water. Call physician.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Methemoglobinemia may occur.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 0°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen are formed.  
4.6 **Behavior in Fire:** Containers may explode.  
4.7 **Auto Ignition Temperature:** 410°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 3.4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Decomposes on exposure to air, light, or water, evolving toxic oxides of nitrogen which are orange in color.  
5.2 **Reactivity with Common Materials:** May corrode metals if wet.  
5.3 **Stability During Transport:** Stable if kept sealed and not exposed to light.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 2  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; USP  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- |                           |                |
|---------------------------|----------------|
| Category                  | Classification |
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | -              |
| Instability (Yellow)..... | 2              |
- 8.6 **EPA Reportable Quantity:** Not listed  
8.7 **EPA Pollution Category:** Not listed  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 117.1  
9.3 **Boiling Point at 1 atm:** 210°F = 99°C = 372°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.8758 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0709  
9.12 **Latent Heat of Vaporization:** 212 Btu/lb = 118 cal/g = 4.94 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -12,500 Btu/lb = - 6,930 cal/g = -290 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISO-AMYL NITRITE

ANI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
45	55.520	51	0.450	51	0.804	45	0.542
50	55.310	52	0.450	52	0.804	50	0.524
55	55.110	53	0.450	53	0.804	55	0.507
60	54.900	54	0.450	54	0.804	60	0.490
65	54.700	55	0.450	55	0.804	65	0.475
70	54.490	56	0.450	56	0.804	70	0.460
75	54.290	57	0.450	57	0.804	75	0.447
80	54.080	58	0.450	58	0.804	80	0.433
85	53.880	59	0.450	59	0.804	85	0.421
90	53.680	60	0.450	60	0.804	90	0.409
95	53.480	61	0.450	61	0.804	95	0.397
100	53.270	62	0.450	62	0.804	100	0.386
105	53.070	63	0.450	63	0.804	105	0.376
110	52.870	64	0.450	64	0.804	110	0.366
115	52.670	65	0.450	65	0.804	115	0.356
120	52.470	66	0.450	66	0.804	120	0.347
125	52.280	67	0.450	67	0.804	125	0.338
130	52.080	68	0.450	68	0.804		
135	51.880						
140	51.680						
145	51.490						
150	51.290						
155	51.100						
160	50.900						
165	50.710						
170	50.510						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.101	70	0.00209	0	0.256
	N	80	0.158	80	0.00319	10	0.256
	S	90	0.241	90	0.00479	20	0.256
	O	100	0.363	100	0.00708	30	0.256
	L	110	0.539	110	0.01032	40	0.256
	U	120	0.789	120	0.01486	50	0.256
	B	130	1.141	130	0.02111	60	0.256
	L	140	1.630	140	0.02964	70	0.256
	E	150	2.300	150	0.04115	80	0.256
		160	3.210	160	0.05651	90	0.256
		170	4.433	170	0.07679	100	0.256
		180	6.060	180	0.10330	110	0.256
		190	8.205	190	0.13780	120	0.256
		200	11.010	200	0.18200	130	0.256
		210	14.640	210	0.23850	140	0.256
		220	19.300	220	0.30980	150	0.256
		230	25.250	230	0.39940	160	0.256
		240	32.780	240	0.51110	170	0.256

# ANILINE

ANL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aminobenzene Aniline oil Benzenamine Blue oil Phenylamine	Oily liquid  Colorless to yellowish brown  Amine odor  Sinks slowly in water.
<b>AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.</b> Wear chemical protective suit with self-contained breathing apparatus. Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GAS IS PRODUCED WHEN HEATED. Vapor may explode if ignited in an enclosed area. Wear chemical protective suit with self-contained breathing apparatus. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Salvage waterfowl  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 9; Aromatic amine  
2.2 **Formula:** C<sub>6</sub>H<sub>5</sub>NH<sub>2</sub>  
2.3 **IMO/UN Designation:** 6.1/1547  
2.4 **DOT ID No.:** 1547  
2.5 **CAS Registry No.:** 62-53-3  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51454

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respirator for organic vapors, splashproof goggles, rubber gloves, boots.
- 3.2 **Symptoms Following Exposure:** ACUTE EXPOSURE: Blue discoloration of finger-tips, cheeks, lips and nose; nausea, vomiting, headache and drowsiness followed by delirium, coma and shock. CHRONIC EXPOSURE: Loss of appetite, loss of weight, headaches, visual disturbances; skin lesions.
- 3.3 **Treatment of Exposure:** Remove victim to fresh air and call a physician at once. SKIN, EYE CONTACT: immediately flush skin or eyes with plenty of water for at least 15 min. If cyanosis is present, shower with soap and warm water, with special attention to scalp and fingernails. Administer oxygen until physician arrives.
- 3.4 **TLV-TWA:** 2 ppm (skin)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None recognized  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.5 ppm  
3.13 **IDLH Value:** 100 ppm  
3.14 **OSHA PEL-TWA:** 5 ppm.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 168°F O.C. 158°F C.C.  
4.2 **Flammable Limits in Air:** 1.3%-11%  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic vapors are generated when heated.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 1139°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 3.0 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water and rinse with dilute acetic acid  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1020 ppm/1 hr/sunfish/killed/fresh water  
10 ppm/96 hr/scenedesmus/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 150%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial: 99.5%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** 5000  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** U012  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 93.13  
9.3 **Boiling Point at 1 atm:** 363.6°F = 184.2°C = 457.4°K  
9.4 **Freezing Point:** 21°F = -6.1°C = 267.1°K  
9.5 **Critical Temperature:** 798.1°F = 425.6°C = 698.8°K  
9.6 **Critical Pressure:** 770 psia = 52.4 atm = 5.31 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.022 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 45.5 dynes/cm = .0455 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 5.8 dynes/cm = 0.0058 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1  
9.12 **Latent Heat of Vaporization:** 198 Btu/lb = 110 cal/g = 4.61 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -14,980 Btu/lb = -8320 cal/g = -348.3 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.02 psia

### NOTES

# ANILINE

ANL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	64.620	35	0.479	30	1.201	40	6.877
50	64.309	40	0.482	40	1.192	50	5.773
60	64.009	45	0.484	50	1.184	60	4.878
70	63.710	50	0.486	60	1.176	70	4.149
80	63.410	55	0.489	70	1.168	80	3.550
90	63.110	60	0.491	80	1.159	90	3.054
100	62.810	65	0.493	90	1.151	100	2.642
110	62.510	70	0.496	100	1.143	110	2.297
120	62.220	75	0.498	110	1.135	120	2.007
130	61.920	80	0.500	120	1.126	130	1.762
140	61.620	85	0.503	130	1.118	140	1.553
150	61.320	90	0.505	140	1.110	150	1.375
160	61.020	95	0.507	150	1.101	160	1.222
170	60.730	100	0.510	160	1.093	170	1.090
180	60.430	105	0.512	170	1.085	180	0.976
190	60.130	110	0.514	180	1.077	190	0.876
200	59.840	115	0.517	190	1.068	200	0.790
210	59.540	120	0.519	200	1.060	210	0.714
						220	0.647
						230	0.589
						240	0.537

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
86	3.700	60	0.003	60	0.00005	0	0.236
		70	0.005	70	0.00009	25	0.250
		80	0.008	80	0.00013	50	0.264
		90	0.013	90	0.00020	75	0.278
		100	0.019	100	0.00030	100	0.292
		110	0.029	110	0.00044	125	0.305
		120	0.042	120	0.00063	150	0.317
		130	0.061	130	0.00090	175	0.330
		140	0.088	140	0.00127	200	0.342
		150	0.125	150	0.00178	225	0.353
		160	0.175	160	0.00245	250	0.365
		170	0.243	170	0.00335	275	0.376
		180	0.334	180	0.00453	300	0.387
		190	0.455	190	0.00608	325	0.397
		200	0.613	200	0.00807	350	0.408
		210	0.820	210	0.01062	375	0.418
						400	0.427
						425	0.437
						450	0.446
						475	0.455
						500	0.463
						525	0.472
						550	0.480
						575	0.488
						600	0.496

# AMMONIUM NITRATE-PHOSPHATE MIXTURE

ANP

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid      Grayish-white      Odorless

Sinks and mixes with water.

Stop discharge if possible. Keep people away.  
Call fire department.  
Avoid contact with solid and dust.  
Isolate and remove discharged material.

### Fire

Not flammable.  
Will increase the intensity of a fire.  
POISONOUS GASES MAY BE PRODUCED IN FIRE.  
Irritating gases may be produced when heated.  
Containers may explode in fire.  
Wear goggles and self-contained breathing apparatus.  
Flood discharge area with water.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

SOLID  
Irritating to skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $\text{NH}_4\text{NO}_3 \cdot (\text{NH}_4)_2\text{H}_2\text{PO}_4 \cdot \text{NH}_4\text{H}_2\text{PO}_4 \cdot \text{CaHPO}_4 \cdot \text{KCl} \cdot \text{K}_2\text{SO}_4$   
2.3 IMO/UN Designation: 9/2071  
2.4 DOT ID No.: 2071  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 140  
2.7 Standard Industrial Trade Classification: 51481

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus must be used when fighting fires. At other times a dust mask is adequate.  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with eyes causes irritation.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. EYES: flush with water for 15 min.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Steam, inert gases, foam, dry chemical  
4.5 **Special Hazards of Combustion**  
**Products:** Toxic and irritating oxides of nitrogen may form in fires.  
4.6 **Behavior in Fire:** Will increase intensity of fire when in contact with combustible material. Containers may explode.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Not pertinent  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Not pertinent  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Corrodes metals to same degree as ordinary fertilizer; the reaction is not hazardous.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Several grades of varying composition, all of which contain less than 70% of ammonium nitrate, the only hazardous ingredient  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Ventilated (natural)  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Class 9  
8.2 **49 CFR Class:** 9  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed  
8.7 **EPA Pollution Category:** Not listed  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.8 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# AMMONIUM NITRATE-PHOSPHATE MIXTURE

ANP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMMONIUM NITRATE-SULFATE MIXTURE

ANS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Mixed fertilizers	Solid                      Grayish-white                      Odorless  Sinks and mixes with water.
Stop discharge if possible. Keep people away. Call fire department. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable Will increase the intensity of a fire. POISONOUS GASES MAY BE PRODUCED IN FIRE. Irritating gases may be produced when heated. Containers may explode in fire. Wear goggles and self-contained breathing apparatus. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{NH}_4\text{NO}_3 \cdot (\text{NH}_4)_2\text{SO}_4$
- 2.3 IMO/UN Designation: 9/2069
- 2.4 DOT ID No.: 2069
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 140
- 2.7 Standard Industrial Trade Classification: 56212

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus must be used when fighting fires. At other times a dust mask is adequate.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air. EYES: flush with water for 15 min.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral rat  $\text{LD}_{50}$  = 58 mg/kg (ammonium sulfate)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Steam, inert gases, foam, dry chemical
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating oxides of nitrogen may form in fires.
- 4.6 **Behavior in Fire:** Will increase intensity of fire when in contact with combustible material. Containers may explode.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Corrodes metals to same degree as ordinary fertilizer; the reaction is not hazardous.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Several grades of varying composition, all of which contain less than 70% of ammonium nitrate, the only hazardous ingredient.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Ventilated (natural)
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed
- 8.7 **EPA Pollution Category:** Not listed
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.8 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# AMMONIUM NITRATE-SULFATE MIXTURE

ANS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# N-AMYL NITRATE

ANT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diesel ignition improver Mixed primary amyl nitrates	Liquid	Colorless to light straw	Ether-like odor
May float or sink in water			
Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. May explode if exposed to heat or flames. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea or headache. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators or nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Collection Systems: Pump; Dredge  
 Clean shore line  
 Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
 2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{ONO}_2$   
 2.3 IMO/UN Designation: 3.3/1112  
 2.4 DOT ID No.: 1112  
 2.5 CAS Registry No.: 1002-16-0  
 2.6 NAERG Guide No.: 140  
 2.7 Standard Industrial Trade Classification: 51140

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Respirator with canister for vapors at high concentrations  
 3.2 **Symptoms Following Exposure:** Inhalation or ingestion may cause headache, methemoglobin, and nausea. Liquid and vapor irritate eyes. Contact with skin may cause slight irritation.  
 3.3 **Treatment of Exposure:** INHALATION: move to fresh air; support respiration; get medical attention. INGESTION: induce vomiting; get medical attention. EYES: irrigate thoroughly with water. SKIN: wash with soap and water.  
 3.4 TLV-TWA: Not listed.  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 IDLH Value: Not listed.  
 3.14 OSHA PEL-TWA: Not listed.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 120°F O.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in a fire.  
 4.6 **Behavior in Fire:** Overheated material may detonate.  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** May form combustible mixture with wood or other combustibles. Liquid will attack some plastics.  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: -  
 Damage to living resources: -  
 Human Oral hazard: -  
 Human Contact hazard: -  
 Reduction of amenities: -

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Mixture containing n-amyl nitrate, 60%; iso-amyl nitrate, 5%, 2 methylbutyl nitrate, 35%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid  
 8.2 49 CFR Class: 3  
 8.3 49 CFR Package Group: III  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0
Special (White).....	OX

 8.6 EPA Reportable Quantity: Not listed  
 8.7 EPA Pollution Category: Not listed  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 133  
 9.3 **Boiling Point at 1 atm:** 292-314°F = 144-156°C = 417-429°K  
 9.4 **Freezing Point:** -190°F = -123°C = 150°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 1.0 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** Currently not available  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** 4.59  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** Currently not available  
 9.13 **Heat of Combustion:** Currently not available  
 9.14 **Heat of Decomposition:** Currently not available  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N-AMYL NITRATE

ANT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
51	63.010		N O T		N O T		N O T
52	62.980						
53	62.940						
54	62.910						
55	62.870		P		P		P
56	62.840		E		E		E
57	62.800		R		R		R
58	62.770		T		T		T
59	62.730		I		I		I
60	62.700		N		N		N
61	62.660		E		E		E
62	62.630		N		N		N
63	62.600		E		E		E
64	62.560		N		N		N
65	62.530						
66	62.490						
67	62.460						
68	62.420						
69	62.390						
70	62.350						
71	62.320						
72	62.280						
73	62.250						
74	62.210						
75	62.180						
76	62.140						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T		N O T		N O T
			P		P		P
			E		E		E
			R		R		R
			T		T		T
			I		I		I
			N		N		N
			E		E		E
			N		N		N

# AMMONIUM NITRATE-UREA SOLUTION

ANU

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nitrex nitrogen solutions (non-pressure) Solar nitrogen solutions	Liquid  Colorless  Slight ammonia odor  Sinks and mixes with water.
Stop discharge if possible. Keep people away. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 43;  
Miscellaneous Water Solutions  
2.2 Formula:  $\text{NH}_4\text{NO}_3\text{-NH}_2\text{CONH}_2\text{-H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 6484-52-2  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification:  
56217

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves.  
3.2 Symptoms Following Exposure: Liquid irritates eyes, particularly those grades that contain a little free ammonia.  
3.3 Treatment of Exposure: EYES: wash with plenty of water for 10-15 min. and rinse with a 5% boric acid solution; call a doctor. SKIN: rinse well with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 Odor Threshold: Not pertinent  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Water of solution may evaporate, and remaining solids may then explode.  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Not pertinent  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Not pertinent  
4.13 Combustion Molar Ratio (Reactant to Product): Currently not available  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Data are for non-pressure solutions containing 44.3% ammonium nitrate, 35.4% urea, and 20.3% water. Other grades contain 0-70% ammonium nitrate, 0-43% urea, 0-36.8% free ammonia, and water. Those containing more than 2% free ammonia are stored under pressure (0-30 psig at 104°F); for hazards of these, see Ammonium Hydroxide.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open; if >2% free ammonia, then pressure-vacuum.  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed  
8.7 EPA Pollution Category: Not listed  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm:  $>212^\circ\text{F} = >100^\circ\text{C} = >373^\circ\text{K}$   
9.4 Freezing Point:  $32^\circ\text{F} = 0^\circ\text{C} = 273^\circ\text{K}$   
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.327 at 20°C (liquid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: 0.0 Btu/lb = 0.0 cal/g = 0.0 J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Varies

### NOTES

# AMMONIUM NITRATE-UREA SOLUTION

ANU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	83.020	34	0.900	34	4.031	51	2.716
36	83.020	36	0.900	36	4.031	52	2.642
38	83.020	38	0.900	38	4.031	53	2.571
40	83.020	40	0.900	40	4.031	54	2.501
42	83.020	42	0.900	42	4.031	55	2.434
44	83.020	44	0.900	44	4.031	56	2.369
46	83.020	46	0.900	46	4.031	57	2.306
48	83.020	48	0.900	48	4.031	58	2.245
50	83.020	50	0.900	50	4.031	59	2.185
52	83.020	52	0.900	52	4.031	60	2.128
54	83.020	54	0.900	54	4.031	61	2.072
56	83.020	56	0.900	56	4.031	62	2.018
58	83.020	58	0.900	58	4.031	63	1.965
60	83.020	60	0.900	60	4.031	64	1.914
62	83.020	62	0.900	62	4.031	65	1.864
64	83.020	64	0.900	64	4.031	66	1.816
66	83.020	66	0.900	66	4.031	67	1.770
68	83.020	68	0.900	68	4.031	68	1.725
						69	1.681
						70	1.638
						71	1.597
						72	1.556
						73	1.517
						74	1.479
						75	1.442
						76	1.407

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMMONIUM OLEATE

AOL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonia soap Oleic acid, ammonium salt	Solid paste  Yellow-brown  Weak ammonia odor  Sinks and mixes with water.
Stop discharge if possible. Keep people away. Avoid contact with solid. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals or water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $C_{17}H_{33}COONH_4 \cdot H_2O$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Contact with eyes causes irritation. Prolonged contact may cause skin irritation.
- 3.3 Treatment of Exposure: EYES OR SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not pertinent
- 4.3 Fire Extinguishing Agents: Water, dry chemical
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 70% in water; Technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: Ventilated (natural)
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed
- 8.7 EPA Pollution Category: Not listed
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid or liquid
- 9.2 Molecular Weight: 299.5 (solute)
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: >1 at 20°C (liquid or solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# AMMONIUM OLEATE

AOL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMMONIUM OXALATE

AOX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium oxalate hydrate Diammonium oxalate Oxalic acid, diammonium salt	Solid  White  Odorless   Sinks and mixes slowly with water.
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear dust respirator and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed 2.2 Formula: $(\text{NH}_4)_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$ 2.3 IMO/UN Designation: 2445 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 6009-70-7 2.6 NAERG Guide No.: 154 2.7 Standard Industrial Trade Classification: 51481
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Approved dust respirator; rubber or plastic-coated gloves; chemical goggles 3.2 <b>Symptoms Following Exposure:</b> Ingestion or excessive inhalation of dust causes systemic poisoning; possible symptoms include pain in throat, esophagus, and stomach; mucous membranes turn white; vomiting, severe purging, weak pulse, cardiovascular collapse, neuromuscular symptoms. Contact with eyes causes irritation. Contact with skin causes irritation or severe burns. 3.3 <b>Treatment of Exposure:</b> Speed is essential. INHALATION: remove to fresh air. INGESTION: call physician immediately; induce vomiting. EYES: flush with water and seek medical attention. SKIN: flush with water. OTHER: watch for swelling of the glottis and delayed constriction of the esophagus. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Currently not available 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Kidney damage 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Odorless 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, foam
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure, 98%-100.5%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 5000
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 142.11
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes at 70°C)
- 9.4 **Freezing Point:** Not pertinent (decomposes at 70°C)
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.50 at 18.5°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 101 Btu/lb = 56 cal/g = 2.3 X 10<sup>6</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# AMMONIUM OXALATE

AOX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	2.533		N O T		N O T		N O T
36	2.666						
38	2.800						
40	2.933						
42	3.066		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	3.200						
46	3.333						
48	3.466						
50	3.600						
52	3.733						
54	3.866						
56	4.000						
58	4.133						
60	4.266						
62	4.400						
64	4.533						
66	4.666						
68	4.800						
70	4.933						
72	5.066						
74	5.200						
76	5.333						
78	5.466						
80	5.600						
82	5.733						
84	5.866						

# AMMONIUM PENTABORATE

APB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium decaborate octahydrate Ammonium pentaborate tetrahydrate	Solid  White  Odorless   Sinks and mixes slowly with water.
<b>Stop discharge if possible. Keep people away. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $\text{NH}_4\text{B}_5\text{O}_{16} \cdot 4\text{H}_2\text{O}$  or  $(\text{NH}_4)_2\text{B}_{10}\text{O}_{16} \cdot 8\text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Disposable-type respirator; side-shield safety spectacles; full-brimmed hard hat; goggles; ammonia gas mask
- 3.2 **Symptoms Following Exposure:** Inhalation of dust may result in non-specific irritation of upper respiratory tract. Ingestion of large quantities may produce symptoms of non-specific irritation of the gastrointestinal tract, nausea, vomiting, cramps, diarrhea. Contact with dust causes moderate eye irritation and minor skin irritation.
- 3.3 **Treatment of Exposure:** INHALATION: move from contaminated atmosphere; if respiratory discomfort persists, see a physician. INGESTION: give large amounts of water or warm salty water to induce vomiting and continue until vomitus is clear; obtain medical attention if abdominal discomfort persists. EYES: flush with large quantities of running water for a minimum of 15 min.; obtain medical help if irritation persists. SKIN: immediately flush affected areas with water; obtain medical help if irritation persists.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire.  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Not pertinent  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Not pertinent  
4.13 Combustion Molar Ratio (Reactant to Product): Currently not available  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Pure, 99%; Radio, 99.98%; Technical, 99.8%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed  
8.7 EPA Pollution Category: Not listed  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 272.20  
9.3 Boiling Point at 1 atm: Not pertinent  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.58 at 15°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# AMMONIUM PENTABORATE

APB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	10.600		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ANTIMONY PENTACHLORIDE

APC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Antimony (V) chloride Antimony perchloride	Liquid      Colorless to brown      Unpleasant odor  Sinks in water. Irritating vapor is produced. Freezing point is 37°F.
Avoid contact with liquid. Keep people away. Wear rubber overclothing (including gloves). Stop discharge if possible. Evacuate. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED. DO NOT USE WATER ON ADJACENT FIRES.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Collection Systems: Pump  
 Chemical and Physical Treatment:  
 Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
 2.2 Formula: SbCl<sub>5</sub>  
 2.3 IMO/UN Designation: 8/1730  
 2.4 DOT ID No.: 1730  
 2.5 CAS Registry No.: 7647-18-9  
 2.6 NAERG Guide No.: 157  
 2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor-acid gas type canister mask; rubber, neoprene, vinyl, etc. gloves; chemical safety goggles, plus face shield where appropriate; acid-resistant clothing, plus apron for splash protection; rubber safety shoes or boots; hard hat.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact of liquid with eyes or skin causes severe burns. Ingestion causes vomiting and severe burns of mouth and stomach. Overexposure by any route can cause bloody stools, slow pulse, low blood pressure, coma, convulsions, cardiac arrest.
- 3.3 **Treatment of Exposure:** INHALATION: remove to clean air; rinse mouth and gargle with water; if overexposure is serious, get prompt medical attention. EYES: flush eyes and eye-lids thoroughly with large amounts of water; get prompt medical attention. SKIN: flush thoroughly with water; remove contaminated clothing; wash affected area with soap and water; if overexposure is serious, get prompt medical attention. INGESTION: dilute by drinking water; if vomiting occurs, administer more water. If overexposure is serious, get prompt medical attention.
- 3.4 TLV-TWA: 0.5 mg/m<sup>3</sup> as antimony  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 Toxicity by Ingestion: Grade 2; oral LD<sub>50</sub> = 1,115 mg/kg (rat), 900 mg/kg (guinea pig)  
 3.8 Toxicity by Inhalation: Currently not available.  
 3.9 Chronic Toxicity: Antimony poisoning may result.  
 3.10 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
 3.11 Liquid or Solid Characteristics: Severe skin irritant; causes second-and third-degree burns on short contact and is very injurious to the eyes.  
 3.12 Odor Threshold: Currently not available  
 3.13 IDLH Value: 50 mg/m<sup>3</sup> as antimony  
 3.14 OSHA PEL-TWA: Not listed.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
 4.2 Flammable Limits in Air: Not flammable  
 4.3 Fire Extinguishing Agents: Not pertinent  
 4.4 Fire Extinguishing Agents Not to Be Used: Do not use water or foam on adjacent fires.  
 4.5 Special Hazards of Combustion Products: Not pertinent  
 4.6 Behavior in Fire: Irritating fumes of hydrogen chloride given off when water or foam is used to extinguish adjacent fire.  
 4.7 Auto Ignition Temperature: Not pertinent  
 4.8 Electrical Hazards: Not pertinent  
 4.9 Burning Rate: Not pertinent  
 4.10 Adiabatic Flame Temperature: Not pertinent  
 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
 4.12 Flame Temperature: Not pertinent  
 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available  
 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts to form hydrogen chloride gas (hydrochloric acid).  
 5.2 Reactivity with Common Materials: Causes corrosion of metal.  
 5.3 Stability During Transport: Stable  
 5.4 Neutralizing Agents for Acids and Caustics: Soda ash or soda ash-lime mixture  
 5.5 Polymerization: Not pertinent  
 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
 6.2 Waterfowl Toxicity: Currently not available  
 6.3 Biological Oxygen Demand (BOD): None  
 6.4 Food Chain Concentration Potential: None  
 6.5 GESAMP Hazard Profile:  
 Bioaccumulation: 0  
 Damage to living resources: 2  
 Human Oral hazard: 1  
 Human Contact hazard: II  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99+%  
 7.2 Storage Temperature: Ambient  
 7.3 Inert Atmosphere: No requirement  
 7.4 Venting: Pressure-vacuum  
 7.5 IMO Pollution Category: Currently not available  
 7.6 Ship Type: Currently not available  
 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
 8.2 49 CFR Class: 8  
 8.3 49 CFR Package Group: II  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	1

 8.6 EPA Reportable Quantity: 1000  
 8.7 EPA Pollution Category: C  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
 9.2 Molecular Weight: 299.05  
 9.3 Boiling Point at 1 atm: (est.) 347°F = 175°C = 448°K  
 9.4 Freezing Point: 37°F = 3°C = 276°K  
 9.5 Critical Temperature: Not pertinent  
 9.6 Critical Pressure: Not pertinent  
 9.7 Specific Gravity: 2.354 at 20°C (liquid)  
 9.8 Liquid Surface Tension: (est.) 15 dynes/cm = 0.015 N/m at 20°C  
 9.9 Liquid Water Interfacial Tension: Not pertinent  
 9.10 Vapor (Gas) Specific Gravity: Not pertinent  
 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
 9.12 Latent Heat of Vaporization: 68.9 Btu/lb = 38.3 cal/g = 1.60 X 10<sup>5</sup> J/kg  
 9.13 Heat of Combustion: Not pertinent  
 9.14 Heat of Decomposition: Not pertinent  
 9.15 Heat of Solution: -211.9 Btu/lb = -117.7 cal/g = -4.925 X 10<sup>5</sup> J/kg  
 9.16 Heat of Polymerization: Not pertinent  
 9.17 Heat of Fusion: 8.0 cal/g  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ANTIMONY PENTACHLORIDE

APC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
51	146.400	51	0.400	51	1.048	40	2.842
52	146.400	52	0.400	52	1.048	45	2.730
53	146.299	53	0.400	53	1.048	50	2.625
54	146.299	54	0.400	54	1.048	55	2.526
55	146.299	55	0.400	55	1.048	60	2.432
56	146.199	56	0.400	56	1.048	65	2.343
57	146.199	57	0.400	57	1.048	70	2.260
58	146.199	58	0.400	58	1.048	75	2.180
59	146.099	59	0.400	59	1.048	80	2.105
60	146.099	60	0.400	60	1.048	85	2.034
61	146.099	61	0.400	61	1.048		
62	146.000	62	0.400	62	1.048		
63	146.000	63	0.400	63	1.048		
64	146.000	64	0.400	64	1.048		
65	145.900	65	0.400	65	1.048		
66	145.900	66	0.400	66	1.048		
67	145.900	67	0.400	67	1.048		
68	145.799	68	0.400	68	1.048		
69	145.799	69	0.400	69	1.048		
70	145.699	70	0.400	70	1.048		
71	145.699	71	0.400	71	1.048		
72	145.699	72	0.400	72	1.048		
73	145.599	73	0.400	73	1.048		
74	145.599	74	0.400	74	1.048		
75	145.599	75	0.400	75	1.048		
76	145.500	76	0.400	76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	60	0.012	60	0.00063		N
	E	70	0.017	70	0.00090		O
	A	80	0.025	80	0.00127		T
	C	90	0.035	90	0.00177		
	T	100	0.049	100	0.00243		P
	S	110	0.068	110	0.00332		E
		120	0.093	120	0.00447		R
		130	0.126	130	0.00596		T
		140	0.169	140	0.00786		I
		150	0.225	150	0.01029		N
		160	0.297	160	0.01333		E
		170	0.387	170	0.01714		N
		180	0.502	180	0.02185		T
		190	0.645	190	0.02764		
		200	0.822	200	0.03471		
		210	1.040	210	0.04328		
		220	1.308	220	0.05361		
		230	1.633	230	0.06598		
		240	2.027	240	0.08071		
		250	2.500	250	0.09814		
		260	3.065	260	0.11870		
		270	3.738	270	0.14270		
		280	4.534	280	0.17080		
		290	5.470	290	0.20330		
		300	6.568	300	0.24090		
		310	7.849	310	0.28410		

# AMMONIUM PERSULFATE

APE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium peroxydisulfate Peroxydisulfuric acid, diammonium salt	Solid  Light straw to colorless  Mild unpleasant odor  Sinks and mixes with water.
Stop discharge if possible. Keep people away. Call fire department. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $(\text{NH}_4)_2\text{S}_2\text{O}_8$   
2.3 IMO/UN Designation: 5.1/1444  
2.4 DOT ID No.: 1444  
2.5 CAS Registry No.: 7727-54-0  
2.6 NAERG Guide No.: 140  
2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** U.S. Bu. Mines approved toxic dust mask; chemical goggles; rubber gloves; neoprene-coated shoes  
3.2 **Symptoms Following Exposure:** Inhalation produces slight toxic effects. Contact with dust irritates eyes and causes skin rash.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air. EYES: wash with water for 20 min.; call a physician. SKIN: wash with water.  
3.4 **TLV-TWA:** 0.1 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 820 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and sulfuric acid fumes may form in fire.  
4.6 **Behavior in Fire:** Decomposes with loss of oxygen that increases intensity of fire  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Not pertinent  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Not pertinent  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Contact with grease, wood, and other combustibles may result in a fire.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
76.3 ppm/96 hr/rainbow trout/TL<sub>50</sub>  
391 ppm/96 hr/grass shrimp/TL<sub>50</sub>  
103 ppm/96 hr/bluegill sunfish/TL<sub>50</sub>  
120 ppm/48 hr/daphnia/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent; pure  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer  
8.2 49 CFR Class: 5.1  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	1

  
8.6 EPA Reportable Quantity: Not listed  
8.7 EPA Pollution Category: Not listed  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 228.20  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes at 120°C)  
9.4 **Freezing Point:** Not pertinent (decomposes at 120°C)  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.98 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** 77 Btu/lb = 43 cal/g = 1.8 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# AMMONIUM PERSULFATE

APE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	59.700		N		N		N
36	60.700		O		O		O
38	61.700		T		T		T
40	62.700						
42	63.700		P		P		P
44	64.700		E		E		E
46	65.700		R		R		R
48	66.700		T		T		T
50	67.700		I		I		I
52	68.700		N		N		N
54	69.700		E		E		E
56	70.700		N		N		N
58	71.700		E		E		E
60	72.700		N		N		N
62	73.700		T		T		T
64	74.700						
66	75.700						
68	76.700						
70	77.700						
72	78.700						
74	79.700						
76	80.700						
78	81.700						
80	82.700						
82	83.700						
84	84.700						

# ANTIMONY PENTAFLUORIDE

APF

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms			
Liquid	Colorless	Sharp odor	
Reacts violently with water. Poisonous gas is produced on contact with water. Freezing point is 45°F.			
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Call fire department. Evacuate. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.			
Fire	Not flammable. May cause fire on contact with combustibles. POISONOUS GASES ARE PRODUCED WHEN HEATED. DO NOT USE WATER OR FOAM ON FIRE OR ON ADJACENT FIRES. Extinguish with dry chemicals or carbon dioxide.		
Exposure	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
2.2 Formula: SbF<sub>5</sub>  
2.3 IMO/UN Designation: 8/1732  
2.4 DOT ID No.: 1732  
2.5 CAS Registry No.: 7783-70-2  
2.6 NAERG Guide No.: 157  
2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Acid-gas-type canister mask; rubber gloves, protective clothing; safety goggles and face shield.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact of liquid with eyes or skin causes severe burns. Ingestion causes vomiting and severe burns of mouth and throat. Overexposure by any route can cause bloody stools, slow pulse, low blood pressure, coma, convulsions, cardiac arrest.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; rinse mouth with water; give oxygen if necessary to assist breathing; get medical attention. EYES: irrigate with copious amounts of water for at least 15 min.; get medical attention. SKIN: flush with copious amounts of water; wash well with soap and water. INGESTION: dilute by drinking water; if vomiting occurs, drink more water; get medical attention promptly.
- 3.4 **TLV-TWA:** 0.5 mg/m<sup>3</sup> as antimony  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Antimony poisoning may result.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 50 mg/m<sup>3</sup> as antimony  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water or foam on adjacent fires.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Gives off toxic hydrogen fluoride fumes when water is used to extinguish adjacent fire.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously to form toxic hydrogen fluoride (hydrofluoric acid).
- 5.2 **Reactivity with Common Materials:**  
When moisture is present, causes severe corrosion of metals (except steel) and glass. If confined and wet can cause explosion. May cause fire in contact with combustible material.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** Not listed
- 8.7 **EPA Pollution Category:** Not listed
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 216.7
- 9.3 **Boiling Point at 1 atm:** 289°F = 143°C = 416°K
- 9.4 **Freezing Point:** 45°F = 7°C = 280°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.340 at 30°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** (est.) 79 Btu/lb = 44 cal/g = 1.8 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ANTIMONY PENTAFLUORIDE

APF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	146.699	51	0.400	51	1.048	51	0.954
52	146.599	52	0.400	52	1.048	52	0.945
54	146.599	53	0.400	53	1.048	53	0.937
56	146.500	54	0.400	54	1.048	54	0.928
58	146.400	55	0.400	55	1.048	55	0.920
60	146.299	56	0.400	56	1.048	56	0.912
62	146.299	57	0.400	57	1.048	57	0.904
64	146.199	58	0.400	58	1.048	58	0.896
66	146.099	59	0.400	59	1.048	59	0.888
68	146.099	60	0.400	60	1.048	60	0.880
70	146.000	61	0.400	61	1.048	61	0.872
72	145.900	62	0.400	62	1.048	62	0.865
74	145.900	63	0.400	63	1.048	63	0.857
76	145.799	64	0.400	64	1.048	64	0.850
78	145.699	65	0.400	65	1.048	65	0.842
80	145.699	66	0.400	66	1.048	66	0.835
82	145.599	67	0.400	67	1.048	67	0.828
84	145.500	68	0.400	68	1.048	68	0.821
86	145.400	69	0.400	69	1.048	69	0.814
88	145.400	70	0.400	70	1.048	70	0.807
		71	0.400	71	1.048	71	0.800
		72	0.400	72	1.048	72	0.794
		73	0.400	73	1.048	73	0.787
		74	0.400	74	1.048	74	0.780
		75	0.400	75	1.048	75	0.774
		76	0.400	76	1.048	76	0.768

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	215	4.127	215	0.12350		N
	E	220	4.534	220	0.13470		O
	A	225	4.975	225	0.14670		T
	C	230	5.450	230	0.15950		
	T	235	5.964	235	0.17330		P
	S	240	6.517	240	0.18800		E
		245	7.113	245	0.20380		R
		250	7.754	250	0.22060		T
		255	8.443	255	0.23850		I
		260	9.181	260	0.25750		N
		265	9.973	265	0.27780		E
		270	10.820	270	0.29940		N
		275	11.730	275	0.32220		T
		280	12.700	280	0.34650		
		285	13.730	285	0.37220		
		290	14.830	290	0.39940		
		295	16.010	295	0.42820		
		300	17.260	300	0.45870		

# ALUMINUM PHOSPHIDE

APH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> AIP Aluminum monophosphide	Solid crystals or powder  Dark gray; dark yellow  May have "fishy", phosphine odor  Sinks and reacts with water to produce poisonous and spontaneously flammable phosphine gas.
<b>AVOID CONTACT WITH SOLID, DUST, OR GASES FROM REACTION WITH WATER. KEEP PEOPLE AWAY.</b> Wear positive pressure breathing apparatus and full protective clothing. Shut off ignition sources and call fire department. Stop discharge, if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE AND POISONOUS GAS PRODUCED ON CONTACT WITH WATER. POISONOUS GASES ALSO PRODUCED IN FIRE. Wear positive pressure breathing apparatus and full protective clothing. DO NOT USE WATER OR FOAM. Extinguish small fires: dry chemical, soda ash or lime. large fires: withdraw from area and let burn. Move container from fire area if you can do it without risk.
<b>Exposure</b>	CALL FOR MEDICAL AID. POISONOUS VAPOR PRODUCED IN REACTION WITH WATER MAY BE FATAL IF INHALED. SEVERE PULMONARY IRRITANT AND AN ACUTE SYSTEMIC POISON; MAY CAUSE SUDDEN OR DELAYED DEATH. Effects may be delayed; Keep under observation. DUST POISONOUS; MAY BE FATAL IF INHALED Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Effects may be delayed; keep under observation.  SOLID POISONOUS IF SWALLOWED OR SKIN EXPOSED IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open periodically if appropriate. Remove and isolate contaminated clothing and shoes. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep warm.
<b>Water Pollution</b>	Effects of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula: AIP
- 2.3 IMO/UN Designation: 4.3/1397
- 2.4 DOT ID No.: 1397
- 2.5 CAS Registry No.: 20859-73-8
- 2.6 NAERG Guide No.: 139
- 2.7 Standard Industrial Trade Classification: 52492

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Highly toxic. May be fatal if inhaled (dust) or swallowed. Also poisonous via skin contact. (Readily reacts with moisture or acids to produce phosphine gas which is a severe pulmonary irritant, an acute poison and spontaneously flammable. Ingestion may result in respiratory, cardiac, hepatic and renal involvement. Exposure to phosphine gas may cause headache, fatigue, nausea, vomiting, cough, severe breathing difficulties, shortness of breath, jaundice, paresthesias, ataxia, intention tremor, diplopia and miocardial injury. Breathing difficulties may be delayed several hours after exposure to phosphine has ceased.)
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air; call for emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Breathing difficulties may be delayed; Keep under observation. EYES OR SKIN: Immediately flush with running water for at least 15 minutes holding upper and lower eyelids open periodically if appropriate. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. INGESTION: If unconscious or having convulsions, do nothing except maintain normal body temperature.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> = 20 mg/kg (human)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** In the presence of moisture, it generates phosphine gas, a severe pulmonary irritant.
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Not pertinent
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (Reacts with moisture to produce phosphine gas which is spontaneously flammable at room temperature.)
- 4.2 **Flammable Limits in Air:** Not pertinent. (Data not available for the phosphine gas produced upon exposure to moisture.)
- 4.3 **Fire Extinguishing Agents:** Small fires: Dry chemical, soda ash or lime. Large fires: Withdraw from area and let fire burn.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water or foam.
- 4.5 **Special Hazards of Combustion Products:** May contain toxic gases and vapors such as oxides of phosphorous and phosphoric acid mist.
- 4.6 **Behavior in Fire:** Can react with water or acids to produce spontaneously flammable and acutely toxic phosphine gas.
- 4.7 **Auto Ignition Temperature:** Not pertinent. (Reacts with water or acids to produce phosphine gas which is spontaneously flammable at room temperature.)
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with water or steam to produce phosphine gas. Phosphine is highly toxic and spontaneously flammable; and its combustion products, such as oxides of phosphorus, are also highly toxic.
- 5.2 **Reactivity with Common Materials:** May react with the moisture in wood to produce spontaneously flammable phosphine gas. Reacts violently with oxidizing substances.
- 5.3 **Stability During Transport:** Stable (when dry)
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Not pertinent
- 6.4 **Food Chain Concentration Potential:**  
Not pertinent
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Dangerous When Wet
- 8.2 49 CFR Class: 4.3
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	4
Instability (Yellow).....	2
Special (White).....	W
- 8.6 EPA Reportable Quantity: 100
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: P006
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 57.96
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: >1832°F. = >1000°C. = >1273°K.
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.85 at 25°C.
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Not pertinent

### NOTES

# ALUMINUM PHOSPHIDE

APH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

# AMMONIUM PICRATE, WET

API

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium carbazate Ammonium picrate (yellow) Ammonium picronitrate Phenol, 2,4,6-trinitro-, ammonium salt	Solid  Yellow  Sinks and slowly mixes with water.
<b>AVOID CONTACT WITH SOLID. KEEP PEOPLE AWAY.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Evacuate area in case of large discharge. Stop discharge if possible. Shut off ignition sources. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Flammable POISONOUS GASES ARE PRODUCED IN FIRE OR WHEN HEATED. DRIED MATERIAL MAY EXPLODE IF EXPOSED TO HEAT, FLAME OR SHOCK. CONTAINERS MAY EXPLODE IN FIRE. Wear self-contained positive pressure breathing apparatus and full protective clothing. Evacuate area in case of significant discharge. Combat fire from protected location. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Toxic via inhalation and percutaneous absorption. Irritating to eyes, skin and mucous membranes. Move victim to fresh air. If in eyes or on skin, flush with running water for at least 15 minutes; hold eyelids open if appropriate. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR ABSORBED THROUGH SKIN. Irritating to eyes and skin. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes. Hold eyelids open if appropriate. Use soap or mild detergent on skin. Remove and isolate contaminated clothing and shoes at the site. If SWALLOWED and victim is CONSCIOUS, have victim drink water and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim quiet and maintain normal body temperature.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters nearby intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Currently not available; Not pertinent  
2.2 **Formula:**  $C_6H_5(NO_2)_3ONH_4$   
2.3 **IMO/UN Designation:** 4.1/1310  
2.4 **DOT ID No.:** 1310  
2.5 **CAS Registry No.:** 131-74-8  
2.6 **NAERG Guide No.:** 113  
2.7 **Standard Industrial Trade Classification:** 51455

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.  
3.2 **Symptoms Following Exposure:** An allergen. Irritating to eyes, skin and mucous membranes. Toxic via inhalation, ingestion and percutaneous absorption. Repeated low grade exposures may cause headache, pruritis, skin eruptions, yellowing of skin and conjunctiva, vomiting, diarrhea, and oliguria. Severe human poisonings, resulting from ingestion of one or two grams of material, may be characterized by gastroenteritis, hemorrhagic nephritis with anuria, acute hepatitis, progressive stupor, coma, and death.  
3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Immediately flush affected area with running water for at least 15 minutes; hold eyelids open if appropriate. Wash skin with soap or mild detergent. Remove and isolate contaminated clothing and shoes at the site. INGESTION: Immediately give victim large quantities of water and have him induce vomiting by touching a finger to the back of the throat. If victim is unconscious or having convulsions, do nothing except keep victim quiet and maintain normal body temperature.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May cause liver and kidney damage.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Irritating to skin and eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Fight fire from an explosion-resistant location. In advanced or massive fire, the area should be evacuated. If fire occurs in the vicinity of this material, water should be used to keep containers cool. Do not move cargo or vehicle if cargo has been exposed to heat. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this action is impossible, withdraw from the area and let the fire burn.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Contain highly toxic NOx fumes.  
4.6 **Behavior in Fire:** Flammable solid. UNCONFINED material burns without detonation when ignited. Confined material will explode upon heating to its ignition temperature.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Reacts with metals, concrete, and plaster to produce salts of picric acid that are much more sensitive to shock than ammonium picrate. Rate of reactivity with metal is increased by the presence of water.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Wet down with water and dike for later disposal. Ammonium picrate should be disposed of only by explosives experts.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
220 ppm/96 hr/bluegill sunfish/LC<sub>50</sub>/fresh water  
66 ppm/96 hr/menidia beryllina (fish)/LC<sub>50</sub>/synthetic seawater  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 90%; 10% water (minimum)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Not listed  
7.4 **Venting:** Not pertinent  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable solid (10% or more water)  
8.2 **49 CFR Class:** 4.1  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** P009  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 246.14  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.719 at room temperature  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -4,941 Btu/lb = -2,745 cal/g = -115x10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Not pertinent

### NOTES

# AMMONIUM PICRATE, WET

API

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
50 75 100 125 150 175 200	0.652 1.355 2.814 5.844 12.136 25.205 52.346		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ARSENIC PENTAOXIDE

APO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arsenic acid anhydride Arsenic oxide Arsenic pentoxide	Amorphous solid      White      Odorless  Sinks and mixes with water.
AVOID CONTACT WITH SOLID. Keep people away. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Move to fresh air. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed  
2.2 Formula: As<sub>2</sub>O<sub>5</sub>  
2.3 IMO/UN Designation: 6.1/1559  
2.4 DOT ID No.: 1559  
2.5 CAS Registry No.: 1303-28-2  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator, gloves, goggles or face shield, protective clothing.  
3.2 **Symptoms Following Exposure:** INHALATION: May cause acute pulmonary edema, with restlessness, dyspnea and coughing attacks. Chronic symptoms may include: numbness, burning, and tingling or itching followed by fasciculation or gross tremors with muscular atrophy and paralysis of lower limbs. EYES: Irritation of conjunctiva, edema of eyelids and corneal necrosis. SKIN: Pigmentation, inflammation, desquamative eczematoid dermatitis and hyperkeratosis. INGESTION: Irritation of stomach and intestines with nausea, vomiting and diarrhea. In severe cases vomitus and stools are bloody. Patient can go into collapse and shock with weak rapid pulse, cold sweats, coma and death. Chronic digestive disturbances. Liver damage with resulting jaundice. Disturbances of blood, kidneys and nervous system.  
3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove from exposure. EYES: Flush with plenty of water. SKIN: Wash thoroughly with plenty of water. INGESTION: Remove ingested arsenic by gastric lavage, emesis and catharsis.  
3.4 **TLV-TWA:** 0.01 mg/m<sup>3</sup> as As.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> below 50 mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Exposure can be followed by tumor development. Cancers of the skin, lungs and ethmoids have been attributed to As exposure.  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. Can cause burning sensation and tenderness in affected areas of the skin.  
3.12 **Odor Threshold:** Odorless.  
3.13 **IDLH Value:** 5 mg/m<sup>3</sup> as arsenic.  
3.14 **OSHA PEL-TWA:** 0.01 mg/m<sup>3</sup> as arsenic.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic arsenic fumes may be produced  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Not pertinent  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Not pertinent  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves in water to give solutions of arsenic acid  
5.2 **Reactivity with Common Materials:** Aluminum and galvanized metal, possibly  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
TL<sub>50</sub> 96 (Fin fish) = 1 to 10 ppm  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 56% As  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 1  
8.7 EPA Pollution Category: X  
8.8 RCRA Waste Number: P011  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 229.82  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes upon melting)  
9.4 Freezing Point: 599°F = 315°C = 588.2°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 4.32 at 25°C  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ARSENIC PENTAOXIDE

APO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
60	15000.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMMONIUM PHOSPHATE

APP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium phosphate, dibasic Diammonium hydrogen phosphate Diammonium orthophosphate Monoammonium orthophosphate Secondary ammonium phosphate	Solid  White  Weak ammonia odor  Sinks and mixes with water.
<b>Stop discharge if possible. Keep people away. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Not flammable. Irritating gases may be produced when heated.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{NH}_4\text{H}_2\text{PO}_4$  and  $(\text{NH}_4)_2\text{HPO}_4$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 7783-28-0
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask, protective gloves, and goggles. When diammonium phosphate is stored in closed area, self-contained breathing apparatus is required to protect against ammonia fumes.
- 3.2 **Symptoms Following Exposure:** Inhalation of monoammonium form causes irritation of mucous membranes; with diammonium form, ammonia vapors in closed area can cause pulmonary edema and asphyxia. Contact with solid or with ammonia gas causes irritation of eyes and skin.
- 3.3 **Treatment of Exposure:** INHALATION: if exposed to ammonia fumes from diammonium phosphate, give artificial respiration and oxygen if needed; enforce rest. EYES: flush with water for at least 15 min.; if irritation persists, get medical attention. SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Toxic and irritating fumes of ammonia and oxides of nitrogen may form in fires.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Sodium hypochlorite
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 155 ppm/96 hr/fathead minnow/LC<sub>50</sub>
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent; Technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: Ventilated (forced)
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed
- 8.7 EPA Pollution Category: Not listed
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: Monoammonium: 115  
Diammonium: 132
- 9.3 Boiling Point at 1 atm: Not pertinent (begins to decompose at 100°C)
- 9.4 Freezing Point: Not pertinent (begins to decompose at 100°C)
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: Diammonium: 1.8 at 20°C (solid) Monoammonium: 1.6 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: 42 Btu/lb = 23 cal/g = 0.97 X 10<sup>6</sup> J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES



# AMMONIUM PHOSPHATE

APP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	55.490		N O T		N O T		N O T
36	56.280						
38	57.060						
40	57.850						
42	58.640		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	59.430						
46	60.220						
48	61.010						
50	61.800						
52	62.590						
54	63.380						
56	64.160						
58	64.950						
60	65.740						
62	66.530						
64	67.320						
66	68.110						
68	68.900						
70	69.690						
72	70.480						
74	71.259						
76	72.049						
78	72.839						
80	73.629						
82	74.419						
84	75.209						

# 2-AMINO-2-METHYL-1-PROPANOL (90% OR LESS)

APR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Aminodimethylethanol beta-Aminoisobutanol AMP AMP-95 Isobutanol amine Isobutanol-2-amine 1-Propanol, 2-amino-2-methyl-	Viscous liquid      Colorless  Miscible with water.
<b>AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.</b> Wear self-contained breathing apparatus and full protective clothing. Stop discharge if possible. Shut off ignition sources and call fire department. Evacuate area. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Wear self-contained breathing apparatus and full protective clothing. Extinguish with dry chemical, carbon dioxide, water spray or alcohol foam. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. IF IN EYES OR ON SKIN, flush with plenty of water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 8;  
Alkanolamines.
- 2.2 Formula:  $\text{CH}_3\text{C}(\text{CH}_3)(\text{NH}_2)\text{CH}_2\text{OH}$
- 2.3 IMO/UN Designation: Data not available.
- 2.4 DOT ID No.: Data not available.
- 2.5 CAS Registry No.: 124-68-5
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51461

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** Causes severe irritation. Inhalation may be fatal as a result of spasm, inflammation, and edema of larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES - OR - SKIN: Flush with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes. Assure adequate flushing of the eyes by separating the eyelids with the fingers.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 1 \text{ g/kg}$  (rabbit)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Data not available.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Data not available.
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 153°F C.C.
- 4.2 **Flammable Limits in Air:** Data not available.
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Data not available.
- 4.5 **Special Hazards of Combustion Products:** Emits toxic fumes during fire conditions.
- 4.6 **Behavior in Fire:** Data not available.
- 4.7 **Auto Ignition Temperature:** Data not available.
- 4.8 **Electrical Hazards:** Data not available.
- 4.9 **Burning Rate:** Data not available.
- 4.10 **Adiabatic Flame Temperature:** Data not available.
- 4.11 **Stoichiometric Air to Fuel Ratio:** Data not available.
- 4.12 **Flame Temperature:** Data not available.
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Data not available.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Data not available.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Data not available.
- 5.5 **Polymerization:** Data not available.
- 5.6 **Inhibitor of Polymerization:** Data not available.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Data not available.
- 6.2 **Waterfowl Toxicity:** Data not available.
- 6.3 **Biological Oxygen Demand (BOD):** Data not available.
- 6.4 **Food Chain Concentration Potential:**  
Data not available.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Different grades of purity up to 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Data not available.
- 7.4 **Venting:** Data not available.
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed
- 8.7 **EPA Pollution Category:** Not listed
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 89.14
- 9.3 **Boiling Point at 1 atm:** 329°F = 165°C = 438.2°K (99+% compound)
- 9.4 **Freezing Point:** 87.8-89.6°F = 31-32°C = 304.2-305.2°K
- 9.5 **Critical Temperature:** Data not available.
- 9.6 **Critical Pressure:** Data not available.
- 9.7 **Specific Gravity:** 0.935
- 9.8 **Liquid Surface Tension:** Data not available.
- 9.9 **Liquid Water Interfacial Tension:** Data not available.
- 9.10 **Vapor (Gas) Specific Gravity:** 3.0
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Data not available.
- 9.12 **Latent Heat of Vaporization:** Data not available.
- 9.13 **Heat of Combustion:** Data not available.
- 9.14 **Heat of Decomposition:** Data not available.
- 9.15 **Heat of Solution:** Data not available.
- 9.16 **Heat of Polymerization:** Data not available.
- 9.17 **Heat of Fusion:** Data not available.
- 9.18 **Limiting Value:** Data not available.
- 9.19 **Reid Vapor Pressure:** Data not available.

### NOTES

# 2-AMINO-2-METHYL-1-PROPANOL (90% OR LESS)

APR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	77	0.019		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.359 0.372 0.385 0.398 0.411 0.423 0.435 0.447 0.459 0.470 0.481 0.492 0.503 0.514 0.524 0.534 0.544 0.554 0.564 0.573 0.582 0.591 0.600 0.608 0.617

# ACETYL PEROXIDE SOLUTION

APS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diacetyl peroxide solution	Liquid  Colorless  Sharp odor  Sinks in water.
<b>Stop discharge if possible. Keep people away.</b> <b>Call fire department.</b> <b>Avoid contact with liquid.</b> <b>Evacuate.</b> <b>Isolate and remove discharged material.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. May explode on contact with combustibles. Containers may explode in fire. Combat fires from safe distance or protected location. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $\text{CH}_3\text{CO}(\text{O}_2)\text{CCH}_3$  in dimethyl phthalate  
2.3 IMO/UN Designation: 5.2/2084  
2.4 DOT ID No.: 2084  
2.5 CAS Registry No.: 110-22-5  
2.6 NAERG Guide No.: 148  
2.7 Standard Industrial Trade Classification: 51699

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective goggles; rubber apron and gloves.  
3.2 **Symptoms Following Exposure:** Contact with liquid causes irritation of eyes and skin. If ingested, irritates mouth and stomach.  
3.3 **Treatment of Exposure:** EYES: wash with plenty of water and get medical attention. SKIN: wash with plenty of soap and water. INGESTION: induce vomiting and call a physician.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 113°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** May explode. Burns with accelerating intensity.  
4.7 **Auto Ignition Temperature:** Explodes  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May ignite combustible materials such as wood.  
5.3 **Stability During Transport:** Heat-and shock- sensitive crystals may separate at very low temperatures during transport.  
5.4 **Neutralizing Agents for Acids and Cautics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 25% acetyl peroxide; 75% dimethyl phthalate  
7.2 **Storage Temperature:** 32°F-100°F (32-41°F optimum)  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Forbidden  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	4

  
8.6 **EPA Reportable Quantity:** Not listed  
8.7 **EPA Pollution Category:** Not listed  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Mixture  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** 17°F = -8°C = 265°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.2 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 4.07  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -15,700 Btu/lb = -8,750 cal/g = -366 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** (est.) -50 Btu/lb = -28 cal/g = -1.2 X 10<sup>5</sup> J/kg  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ACETYL PEROXIDE SOLUTION

APS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	76.089	34	0.420	34	0.967	34	5.243
36	76.020	36	0.420	36	0.967	36	5.084
38	75.950	38	0.420	38	0.967	38	4.930
40	75.879	40	0.420	40	0.967	40	4.783
42	75.809	42	0.420	42	0.967	42	4.641
44	75.740	44	0.420	44	0.967	44	4.504
46	75.669	46	0.420	46	0.967	46	4.372
48	75.599	48	0.420	48	0.967	48	4.245
50	75.530	50	0.420	50	0.967	50	4.123
52	75.459	52	0.420	52	0.967	52	4.005
54	75.389	54	0.420	54	0.967	54	3.892
56	75.320	56	0.420	56	0.967	56	3.782
58	75.250	58	0.420	58	0.967	58	3.677
60	75.179	60	0.420	60	0.967	60	3.575
62	75.110	62	0.420	62	0.967	62	3.476
64	75.049	64	0.420	64	0.967	64	3.381
66	74.980	66	0.420	66	0.967	66	3.290
68	74.910	68	0.420	68	0.967	68	3.201
70	74.839	70	0.420	70	0.967	70	3.116
72	74.770	72	0.420	72	0.967	72	3.033
74	74.700	74	0.420	74	0.967	74	2.954
76	74.629	76	0.420	76	0.967	76	2.877
78	74.559	78	0.420	78	0.967	78	2.802
80	74.490	80	0.420	80	0.967	80	2.730
82	74.419	82	0.420	82	0.967	82	2.660
84	74.349	84	0.420	84	0.967	84	2.593

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ANTIMONY POTASSIUM TARTRATE

APT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Potassium antimonyl tartrate Tartar emetic Tartarized antimony Tartrated antimony	Solid  White  Odorless   Sinks in water.
<b>AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.</b> Wear dust respirator and rubber overclothing (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause dizziness, headache, coughing, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. If swallowed will cause nausea, dizziness, loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators or nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed  
2.2 **Formula:**  $\text{KOOC}\cdot\text{CHOH}\cdot\text{CHOH}\cdot\text{COO}(\text{SbO})\cdot\frac{1}{2}\text{H}_2\text{O}$   
2.3 **IMO/UN Designation:** 6.1/1551  
2.4 **DOT ID No.:** 1551  
2.5 **CAS Registry No.:** 28300-74-5  
2.6 **NAERG Guide No.:** 151  
2.7 **Standard Industrial Trade Classification:** 51391

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; rubber or plastic-coated gloves; chemical goggles; tightly woven, close fitting clothes; Bu. Mines approved respirator  
3.2 **Symptoms Following Exposure:** Inhalation causes inflammation of membranes of nose and throat, upper respiratory irritation, headache, dizziness. Ingestion causes gastrointestinal upset, strong irritation, vomiting. Contact with eyes or skin causes irritation. Further symptoms of exposure include nervous complaints (i.e., irritability, dizziness, muscular and neurological pain).  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: call physician immediately; use water (plain, soapy, or salty) or milk (3-4 glasses) to provoke vomiting. EYES: flush with water for 15 min.; consult a physician. SKIN: flush with water; wash well with soap and water.  
3.4 **TLV-TWA:** 0.5 mg/m<sup>3</sup> (as antimony)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral rat LD<sub>50</sub> = 115 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 50 mg/m<sup>3</sup> as antimony  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Not pertinent  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Not pertinent  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
20 ppm/96 hr/fathead minnow/TL<sub>50</sub>/ fresh (soft) water  
12 ppm/96 hr/fathead minnow/TL<sub>50</sub>/ fresh (hard) water  
\*as antimony  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** High  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure, 99-103%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 100  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 334  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 2.60 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ANTIMONY POTASSIUM TARTRATE

APT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	8.700		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 4-AMINOPYRIDINE

APY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> p-Aminopyridine Avitrol 4-Pyridinamine 4-Pyridylamine	Solid (powder)      White  Sinks and mixes with water.	Slight, characteristic
<b>AVOID CONTACT WITH SOLID OR DUST. KEEP PEOPLE AWAY.</b> Wear positive pressure breathing apparatus and special chemical protective clothing. Stop leak if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Wear positive pressure breathing apparatus and special chemical protective clothing. Extinguish small fires: dry chemical, carbon dioxide, water spray or alcohol foam; large fires: water spray, fog or alcohol foam. Combat fire from safe distance or protected location (behind barrier) with unmanned monitor nozzle.	
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS. MAY BE FATAL IF INHALED OR ABSORBED THROUGH SKIN. Irritating to eyes, skin and respiratory tract; may burn skin and eyes. Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS. MAY BE FATAL IF SWALLOWED OR ABSORBED THROUGH SKIN. Irritating to eyes and skin and may cause burns. IF IN EYES OR ON SKIN, flush immediately with running water for at least 15 minutes; hold eyelids open occasionally if appropriate. Speed in removing material from skin is extremely important. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. IF SWALLOWED and victim is CONSCIOUS, have victim induce vomiting by touching back of throat with a finger. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula: C<sub>5</sub>H<sub>4</sub>NH<sub>2</sub>
- 2.3 IMO/UN Designation: 6.1/2671
- 2.4 DOT ID No.: 2671
- 2.5 CAS Registry No.: 504-24-5
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51453

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear positive pressure breathing apparatus and special chemical protective clothing.
- 3.2 **Symptoms Following Exposure:** Extremely toxic. May be fatal if inhaled, swallowed or absorbed through skin. Irritates eyes, skin and mucous membranes. May cause convulsions, dizziness, dyspnea, headache, hypertension, nausea and vomiting, and weakness.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air; call emergency medical care. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Immediately flush contaminated area with water for at least 15 minutes; hold upper and lower eyelids open occasionally, if appropriate. Speed in removing material from skin is extremely important. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. Call physician. INGESTION: If victim is conscious, induce vomiting with syrup of ipecac or have the victim touch the back of the throat with a finger. If victim is unconscious, do nothing except keep victim warm. Call emergency medical care immediately.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> = 20 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Irritates skin and eyes; may cause burns.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 328°F.O.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, carbon dioxide, water spray or alcohol foam. Large fires: Water spray, fog or alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Contain highly toxic and irritating fumes including NOx.
- 4.6 **Behavior in Fire:** Produces highly toxic and irritating fumes. Containers may explode in heat of fire.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 2.82-7.56 ppm/96 hr/bluegill/ TL<sub>50</sub>/fresh water at 12-22°C.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Not listed
- 7.4 **Venting:** Not listed
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	-
Instability (Yellow).....	-
- 8.6 EPA Reportable Quantity: 1000
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: P008
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 94.12
- 9.3 Boiling Point at 1 atm: 524.3°F. = 273.5°C. = 546.7°K.
- 9.4 Freezing Point: 311-316°F. = 155-158°C. = 428-431°K.
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.2607 at 25.3°C. (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES



# 4-AMINOPYRIDINE

APY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	7.700		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ARSENIC DISULFIDE

ARD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Realgar Red arsenic glass Red arsenic sulfide Red orpiment Ruby arsenic	Solid  Red-brown  Odorless   Sinks in water.
<b>AVOID CONTACT WITH SOLID AND DUST. Keep people away.</b> <b>Avoid inhalation.</b> <b>Wear chemical protective suit with self-contained breathing apparatus.</b> <b>Isolate and remove discharged material.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable. Wear chemical protective suit with self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Harmful to skin. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Will burn eyes and skin. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
2.2 Formula: As<sub>2</sub>S<sub>3</sub>  
2.3 IMO/UN Designation: 6.1/1557  
2.4 DOT ID No.: 1557  
2.5 CAS Registry No.: 1303-32-8  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification: 52342

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator; goggles; rubber gloves; clean protective clothing
- 3.2 **Symptoms Following Exposure:** (Acute and sub-acute poisoning are not common.) Repeated inhalation causes irritation of nose, laryngitis, mild bronchitis. Ingestion causes weakness, loss of appetite, gastrointestinal disturbances, peripheral neuritis, occasional hepatitis. Contact with eyes causes irritation. Irritates skin, especially where moist; if not treated, may cause ulceration.
- 3.3 **Treatment of Exposure:** Consult physician after all overexposure to this compound. INHALATION: move to fresh air. INGESTION: induce vomiting by giving warm salt water; repeat until vomit is clear. EYES: flush with water for at least 15 min. SKIN: wash well with water.
- 3.4 **TLV-TWA:** 0.01 mg/m<sup>3</sup> (as arsenic)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub><50 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Possible skin and lung cancer.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 5 mg/m<sup>3</sup> as arsenic.  
3.14 **OSHA PEL-TWA:** 0.01 mg/m<sup>3</sup> as arsenic.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Poisonous fumes of the compound may be formed in fires. If ignited, will form sulfur dioxide gas.
- 4.6 **Behavior in Fire:** May ignite at very high temperatures
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%; Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 214
- 9.3 **Boiling Point at 1 atm:** 1,049°F = 565°C = 838°K
- 9.4 **Freezing Point:** 585°F = 307°C = 580°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 3.5 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ARSENIC DISULFIDE

ARD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ASPHALT BLENDING STOCKS: ROOFERS FLUX

ARF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Asphaltum Asphaltum oil Dust-laying oil Fluxing oil Liquid asphalt Petroleum tailings Residual oil Road oil	Oily liquid (generally heated)      Dark brown to black      Tar odor  May float or sink in water. Rubbery solid is produced when cooled.
Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. FOULING to SHORELINE. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim; Dredge  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 33;  
 Miscellaneous Hydrocarbon Mixtures  
 2.2 **Formula:** Not pertinent  
 2.3 **IMO/UN Designation:** 3.2/1999; 3.3/1999  
 2.4 **DOT ID No.:** 1999  
 2.5 **CAS Registry No.:** Currently not available  
 2.6 **NAERG Guide No.:** 130  
 2.7 **Standard Industrial Trade Classification:** 33540

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective clothing; face and eye protection  
 3.2 **Symptoms Following Exposure:** Inhalation of vapors from semi-solid materials causes moderate irritation of nasal and upper respiratory tract passages. Aspiration causes slow onset and low degree of chemical pneumonitis with clinical symptoms of lower respiratory tract irritation. Ingestion produces irritation of gastrointestinal tract.  
 3.3 **Treatment of Exposure:** INHALATION OR ASPIRATION: treatment usually unnecessary. INGESTION: do NOT induce vomiting; do NOT lavage; administer 2-4 oz of olive oil and 1-2 oz of activated charcoal. EYES: wash with plenty of water. SKIN: wipe off material and wash with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None observed  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause irritation of eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 300-550°F C.C.  
 4.2 **Flammable Limits in Air:** Not pertinent  
 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 400-700°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** Currently not available  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
 7.2 **Storage Temperature:** Elevated  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed  
 8.7 **EPA Pollution Category:** Not listed  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** Not pertinent  
 9.3 **Boiling Point at 1 atm:** Not pertinent  
 9.4 **Freezing Point:** 20 to 110°F = -7 to 43°C = 266 to 316°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** (est.) 1.11 at 50°C (liquid)  
 9.8 **Liquid Surface Tension:** Currently not available  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** Currently not available  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ASPHALT BLENDING STOCKS: ROOFERS FLUX

ARF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
124	68.660	85	0.395	175	0.970	220	93.250
126	68.660	90	0.401	180	0.970	230	85.889
128	68.660	95	0.407	185	0.970	240	79.299
130	68.660	100	0.414	190	0.970	250	73.379
132	68.660	105	0.420	195	0.970	260	68.049
134	68.660	110	0.426	200	0.970	270	63.240
136	68.660	115	0.433	205	0.970	280	58.880
138	68.660	120	0.439	210	0.970	290	54.930
140	68.660	125	0.446	215	0.970	300	51.340
142	68.660	130	0.452	220	0.970	310	48.060
144	68.660	135	0.458	225	0.970	320	45.080
146	68.660	140	0.465	230	0.970	330	42.340
148	68.660	145	0.471	235	0.970	340	39.840
150	68.660	150	0.478	240	0.970	350	37.540
152	68.660			245	0.970	360	35.420
154	68.660			250	0.970	370	33.470
156	68.660			255	0.970	380	31.670
158	68.660			260	0.970	390	30.000
160	68.660						
162	68.660						
164	68.660						
166	68.660						
168	68.660						
170	68.660						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	210	0.018		C		N
	N	220	0.026		U		O
	S	230	0.037		R		T
	O	240	0.053		R		P
	L	250	0.074		E		E
	U	260	0.103		N		R
	B	270	0.142		T		T
	I	280	0.193		L		I
	E	290	0.262		Y		N
		300	0.352				E
		310	0.470		N		N
		320	0.622		O		T
		330	0.817		T		
		340	1.067				
		350	1.384		A		
		360	1.783		V		
		370	2.284		A		
		380	2.909		I		
					L		
					A		
					B		
					L		
					E		

# ACROLEIN

ARL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acraldehyde Acrylic aldehyde Allyl aldehyde Ethylene aldehyde 2-Propenal	Watery liquid  Colorless to light yellow  Sharp, irritating odor  Floats and mixes with water. Poisonous, flammable vapor is produced.
<b>AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Stop discharge if possible. Avoid inhalation. Evacuate area in case of large discharge. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> POISONOUS GASES ARE PRODUCED WHEN HEATED. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Combat fires from safe distance or protected location. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn eyes. Irritating to skin. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Currently not available; Aldehyde  
2.2 **Formula:** CH<sub>2</sub>=CHCHO  
2.3 **IMO/UN Designation:** 6.1/1092  
2.4 **DOT ID No.:** 1092  
2.5 **CAS Registry No.:** 107-02-8  
2.6 **NAERG Guide No.:** 131P  
2.7 **Standard Industrial Trade Classification:** 51621

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles and face shield; self-contained breathing apparatus, positive-pressure hose mask, airline mask or industrial canister-type gas mask; rubber safety shoes; clothing made of rubber or other impervious material.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat, a feeling of pressure in the chest, and shortness of breath. Nausea and vomiting commonly occur. Loss of consciousness if exposure has been sufficiently great. Congestion in the chest may be present in varying amounts, and fluid may collect in the lungs (pulmonary edema) of severely exposed persons. Vapor also causes severe eye irritation (redness, weeping, and swelling of lids); liquid burns eyes, contact with skin causes reddening or blistering. Ingestion causes severe irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** Keep patient warm; if he is conscious, give coffee; call physician after all exposures to this compound. **INHALATION:** remove patient to fresh air; if breathing becomes difficult, give oxygen. If breathing has stopped, start artificial respiration. **EYES:** immediately flush with plenty of water for at least 15 min. If medical attention is not immediately available, continue eye irrigation for another 15-min. period. Upon completion of the first 15 min. of irrigation, it is permissible to instill 2 or 3 drops of an effective aqueous local eye anesthetic for relief of pain. No oils or ointments should be used unless ordered by the physician. **SKIN:** flush at once with large volumes of water. Wash thoroughly with soap and large quantities of running water. **INGESTION:** have victim drink large amounts of water. Induce vomiting by sticking a finger down the throat or by giving salt water (one tablespoon of table salt to a glass of water). Keep patient warm and quiet.
- 3.4 **TLV-TWA:** 0.1 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 0.3 ppm (Notice of Intended Change to 0.1 ppm).  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> below 50 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Grade 4; oral rat LD<sub>50</sub> = 46 mg/kg. Grade 4; oral rabbit LD<sub>50</sub> = 7 mg/kg  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** 0.21 ppm  
3.13 **IDLH Value:** 2 ppm  
3.14 **OSHA PEL-TWA:** 0.1 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEG1:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** <0°F O.C.; -13°F C.C.  
4.2 **Flammable Limits in Air:** 2.8%-31%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Poisonous vapor of acrolein is formed from hot liquid.  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. Polymerization may take place, and containers may explode in fire.  
4.7 **Auto Ignition Temperature:** 453°F  
4.8 **Electrical Hazards:** I, B(C)  
4.9 **Burning Rate:** 3.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable when inhibited  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Undergoes uncatalyzed polymerization reaction around 200°C. Light promotes polymerization.  
5.6 **Inhibitor of Polymerization:** Hydroquinone: 0.10 to 0.25%

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 0.08 ppm/24 hr/salmon/TL<sub>m</sub>/fresh water  
0.055 ppm/96 hr/oyster/EC<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 33%, 10 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: T  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Industrial, 92+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	3
Instability (Yellow).....	3

  
8.6 **EPA Reportable Quantity:** 1  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** P003  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 56.1  
9.3 **Boiling Point at 1 atm:** 127°F = 53°C = 326°K  
9.4 **Freezing Point:** -125°F = -87°C = 186°K  
9.5 **Critical Temperature:** (est.) 489°F = 254°C = 527°K  
9.6 **Critical Pressure:** (est.) 737 psia = 50.0 atm = 5.08 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.843 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 35 dynes/cm = 0.035 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 1.94  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1487  
9.12 **Latent Heat of Vaporization:** 216 Btu/lb = 120 cal/g = 5.02 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -12,500 Btu/lb = -6,950 cal/g = -290 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** (est.) -50 Btu/lb = -28 cal/g = -1.2 X 10<sup>5</sup> J/kg  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 8.6 psia

### NOTES

# ACROLEIN

ARL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
20	53.710	0	0.522	0	1.654	0	0.525
30	53.480	10	0.524	10	1.626	5	0.508
40	53.250	20	0.527	20	1.598	10	0.492
50	53.020	30	0.529	30	1.570	15	0.477
60	52.790	40	0.532	40	1.542	20	0.463
70	52.560	50	0.534	50	1.514	25	0.449
80	52.330	60	0.537	60	1.486	30	0.436
90	52.110	70	0.539	70	1.458	35	0.424
100	51.881	80	0.542	80	1.430	40	0.412
110	51.650	90	0.544	90	1.402	45	0.401
120	51.420	100	0.547	100	1.374	50	0.390
		110	0.549	110	1.346	55	0.380
		120	0.552	120	1.318	60	0.370
						65	0.361
						70	0.352
						75	0.344
						80	0.336
						85	0.328
						90	0.320
						95	0.313
						100	0.306
						105	0.299
						110	0.293
						115	0.287
						120	0.281
						125	0.275

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	20.060	40	3.398	40	0.03554	100	0.285
36	20.110	50	4.358	50	0.04469	120	0.293
38	20.170	60	5.537	60	0.05568	140	0.300
40	20.220	70	6.971	70	0.06878	160	0.307
42	20.280	80	8.701	80	0.08426	180	0.315
44	20.330	90	10.770	90	0.10240	200	0.322
46	20.390	100	13.240	100	0.12360	220	0.329
48	20.440	110	16.150	110	0.14820	240	0.337
50	20.500	120	19.570	120	0.17640	260	0.344
52	20.560	130	23.560	130	0.20880	280	0.351
54	20.610	140	28.190	140	0.24560	300	0.359
56	20.670	150	33.520	150	0.28740	320	0.366
58	20.720	160	39.650	160	0.33440	340	0.373
60	20.780	170	46.640	170	0.38710	360	0.380
62	20.830	180	54.590	180	0.44600	380	0.388
64	20.890	190	63.590	190	0.51150	400	0.395
66	20.940	200	73.730	200	0.58410	420	0.402
68	21.000	210	85.099	210	0.66420	440	0.410
70	21.060						
72	21.110						
74	21.170						
76	21.220						
78	21.280						
80	21.330						
82	21.390						
84	21.440						

# ARSENIC TRISULFIDE

ART

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arsenic yellow King's gold King's yellow Orpiment Yellow arsenic sulfide	Solid Yellow-orange Odorless  Sinks in water.
AVOID CONTACT WITH SOLID AND DUST. Keep people away. Wear chemical protective suit with self-contained breathing apparatus. Avoid inhalation. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. Wear chemical protective suit with self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Harmful to skin. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Will burn eyes and skin. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
 2.2 Formula: As<sub>2</sub>S<sub>3</sub>  
 2.3 IMO/UN Designation: 6.1/1557  
 2.4 DOT ID No.: 1557  
 2.5 CAS Registry No.: 1303-33-9  
 2.6 NAERG Guide No.: 152  
 2.7 Standard Industrial Trade Classification: 52342

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; goggles; rubber gloves; clean protective clothing
- 3.2 **Symptoms Following Exposure:** (Acute and sub-acute poisoning are not common.) Repeated inhalation causes irritation of nose, laryngitis, mild bronchitis. Ingestion causes weakness, loss of appetite, gastrointestinal disturbances, peripheral neuritis, occasional hepatitis. Contact with eyes causes irritation. Irritates skin, especially where moist; if not treated, may cause ulceration.
- 3.3 **Treatment of Exposure:** Consult physician after all overexposures to this compound. INHALATION: Move to fresh air. INGESTION: Induce vomiting by giving warm salt water; repeat until vomit is clear. EYES: Flush with water for at least 15 min. SKIN: Wash well with water.
- 3.4 **TLV-TWA:** 0.01 mg/m<sup>3</sup> (as arsenic)  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub><50 mg/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Possible skin and lung cancer  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Odorless  
 3.13 **IDLH Value:** 5 mg/m<sup>3</sup> as arsenic.  
 3.14 **OSHA PEL-TWA:** 0.01 mg/m<sup>3</sup> as arsenic.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Poisonous fumes of the compound may be formed in fires.
- 4.6 **Behavior in Fire:** May ignite at very high temperatures.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; Pure, 99+%; Optical grade, 99.99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Not pertinent
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 1
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 246
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** 572°F = 300°C = 573°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 3.43 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ARSENIC TRISULFIDE

ART

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ARSENIC

ARX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arsenic, metallic Arsenic, solid Gray arsenic	Solid crystals      Gray  Sinks in water.
<b>AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Stay upwind and use water spray to "knock down" dust. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Can be heated to burn in air. POISONOUS GASES ARE PRODUCED IN FIRE. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, carbon dioxide, water spray or foam; large fires: water spray, fog or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Move victim to fresh air. IF IN EYES OR ON SKIN, immediately flush with running water for at least 15 minutes; hold eyelids open if necessary. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open if necessary. IF SWALLOWED and victim is CONSCIOUS and has not vomited, induce vomiting with syrup of ipecac. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula: As
- 2.3 IMO/UN Designation: 6.1/1558
- 2.4 DOT ID No.: 1558
- 2.5 CAS Registry No.: 7440-38-2
- 2.6 NAERG Guide No.: 152
- 2.7 Standard Industrial Trade Classification: 52499

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Poisonous by inhalation of dust or by ingestion. Regardless of exposure route, symptoms in most cases are characteristic of severe gastritis or gastroenteritis. All chemical forms of arsenic eventually produce similar toxic effects. Symptoms may be delayed.
- 3.3 **Treatment of Exposure:** Get medical attention after any exposure to this metal. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Immediately flush with running water for at least 15 minutes; hold eyelids open if appropriate. Use soap and water to clean skin. Remove and isolate contaminated clothing and shoes. INGESTION: If the victim is alert and has not vomited, induce vomiting with syrup of ipecac.
- 3.4 TLV-TWA: 0.01 mg/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Human carcinogen. Causes mutagenic, reproductive and tumorigenic effects along with damage to the gastrointestinal tract and degeneration of the liver and kidneys.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: 5 mg/m<sup>3</sup>
- 3.14 OSHA PEL-TWA: 0.01 mg/m<sup>3</sup>
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, carbon dioxide, water spray or foam; large fires: water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
**Products:** Contain highly toxic arsenic trioxide and other forms of arsenic. Arsenic gas, the most dangerous form of arsenic, is produced upon contact with an acid or acid fumes.
- 4.6 **Behavior in Fire:** Burns to produce dense white fumes of highly toxic arsenic trioxide.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:**  
Currently not available
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Incompatible with zinc, oxidizing agents, and chemically active metals
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Bioaccumulated by fresh water and marine aquatic organisms.
- 6.5 **GESAMP Hazard Profile:**  
**Bioaccumulation:** 0  
**Damage to living resources:** (3)  
**Human Oral hazard:** 2  
**Human Contact hazard:** II  
**Reduction of amenities:** XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Crude, 90-95%; Refined, 99%; Semiconductor, 99.999%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Not listed
- 7.4 **Venting:** Not pertinent
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 1
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 74.9216
- 9.3 **Boiling Point at 1 atm:** 1,135°F = 613°C = 886°K (sublimes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** 1477.4°F = 803°C = 1076.2°K
- 9.6 **Critical Pressure:** 5027.4 psia = 342.0 atm = 34.6 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 5.727 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ARSENIC

ARX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ARSENIC ACID

ASA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Orthoarsenic acid	Solid crystals or solution White or colorless Odorless  Sinks and mixes with water. Freezing point is 95°F.
<p><b>AVOID CONTACT WITH SOLUTION, SOLID AND DUST.</b>  <b>KEEP PEOPLE AWAY.</b>  Wear rubber overclothing (including gloves).  Avoid inhalation.  Stop discharge if possible.  Isolate and remove discharged material.  Notify local health and pollution control agencies.</p>	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.  DUST  POISONOUS IF INHALED.  Irritating to eyes, nose and throat.  Move victim to fresh air.  If in eyes, hold eyelids open and flush with plenty of water.  If breathing is difficult, give oxygen.  SOLUTION OR SOLID  POISONOUS IF SWALLOWED.  Irritating to skin and eyes.  Remove contaminated clothing and shoes.  Flush affected areas with plenty of water.  IF IN EYES, hold eyelids open and flush with plenty of water.  IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>
<b>Water Pollution</b>	<p>Effect of low concentrations on aquatic life is unknown.  May be dangerous if it enters water intakes.  Notify local health and wildlife officials.  Notify operators of nearby water intakes.</p>

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
2.2 Formula: As<sub>2</sub>O<sub>5</sub> or H<sub>3</sub>AsO<sub>4</sub> 1/2H<sub>2</sub>O  
2.3 IMO/UN Designation: 6.1/1554  
2.4 DOT ID No.: 1554  
2.5 CAS Registry No.: 1327-52-2  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 52236

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Calamine lotion and zinc oxide powder on hands and other skin areas; rubber gloves; U. S. Bureau of Mines approved dust respirator.
- 3.2 **Symptoms Following Exposure:** Ingestion causes irritation of stomach, weakness, other gastrointestinal symptoms. Overdose can cause arsenic poisoning, but symptoms are delayed.
- 3.3 **Treatment of Exposure:** Get medical attention after all exposures to this compound. Be alert for arsenic poisoning symptoms. SKIN: wash well with soap and water. INGESTION: induce vomiting; drink freely lime water, milk, or raw egg; give a cathartic.
- 3.4 **TLV-TWA:** 0.01 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; oral LD<sub>50</sub> = 48 mg/kg (young rats)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Arsenic compounds may be carcinogenic.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Will corrode metal and may give off toxic arsine gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** P010
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 229.8
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.2 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 3.1 Btu/lb = 1.7 cal/g = 0.071 X 10<sup>3</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ARSENIC ACID

ASA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	39.150		N		N		N
36	39.200		O		O		O
38	39.250		T		T		T
40	39.300						
42	39.360		P		P		P
44	39.410		E		E		E
46	39.460		R		R		R
48	39.510		T		T		T
50	39.560		I		I		I
52	39.610		N		N		N
54	39.660		E		E		E
56	39.710		N		N		N
58	39.760		E		E		E
60	39.820		N		N		N
62	39.870		T		T		T
64	39.920						
66	39.970						
68	40.020						
70	40.070						
72	40.120						
74	40.170						
76	40.220						
78	40.280						
80	40.330						
82	40.380						
84	40.430						

# ANISOYL CHLORIDE

ASC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> p-Anisoyl chloride	Liquid  Yellow to brown  Sharp, penetrating odor  Reacts with water. Irritating vapor is produced. Freezing point is 72°F.
Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Keep people away. Avoid inhalation. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER ON ADJACENT FIRES.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $p\text{-CH}_3\text{OC}_6\text{H}_4\text{COCl}$   
2.3 IMO/UN Designation: 8/1729  
2.4 DOT ID No.: 1729  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 156  
2.7 Standard Industrial Trade Classification: 51244

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles and face shield; plastic gloves; protective clothing.  
3.2 **Symptoms Following Exposure:** Vapor irritates mucous membranes. Contact of liquid with eyes or skin causes severe irritation. Ingestion causes severe irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air. EYES: flush with water for at least 15 min.; get medical attention. SKIN: flush with water; wash well with soap and water. INGESTION: do NOT induce vomiting; give large amounts of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam  
4.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may be formed.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly to generate hydrogen chloride (hydrochloric acid). The reaction is not hazardous.  
5.2 **Reactivity with Common Materials:** Corrodes metal slowly  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (1)  
Human Oral hazard: (1)  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed  
8.7 **EPA Pollution Category:** Not listed  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 171.6  
9.3 **Boiling Point at 1 atm:** 504°F = 262°C = 535°K  
9.4 **Freezing Point:** 72°F = 22°C = 295°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.26 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -10,500 Btu/lb = -5,830 cal/g = -244 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) 90 Btu/lb = 50 cal/g = 2.1 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ANISOYL CHLORIDE

ASC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
72	78.509	72	0.400		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T I V E	395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500	3.302 3.567 3.849 4.150 4.471 4.812 5.175 5.561 5.971 6.406 6.868 7.357 7.875 8.423 9.003 9.615 10.260 10.950 11.670 12.430 13.230 14.070	395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500	0.06177 0.06633 0.07116 0.07629 0.08171 0.08745 0.09352 0.09993 0.10670 0.11380 0.12140 0.12930 0.13760 0.14640 0.15560 0.16530 0.17550 0.18620 0.19740 0.20920 0.22150 0.23440		N O T  P E R T I N E N T

# AMMONIUM SULFIDE

ASF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium hydrogen sulfide solution Ammonium sulphydrate solution Ammonium sulfide solution	Liquid  Colorless to yellow  Strong odor of rotten eggs and ammonia  Mixes with water. Irritating vapor is produced. Boiling point is 104°F.
Avoid contact with liquid and vapor. Keep people away. Wear rubber overclothing (including gloves). Avoid inhalation. Shut off ignition sources. Call fire department. Stop discharge if possible. Stay upwind. Use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, headache, coughing, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed 2.2 Formula: (NH <sub>4</sub> ) <sub>2</sub> S-NH <sub>4</sub> SH-H <sub>2</sub> O 2.3 IMO/UN Designation: 8/2683 2.4 DOT ID No.: 2683 2.5 CAS Registry No.: 12135-76-1 2.6 NAERG Guide No.: 132 2.7 Standard Industrial Trade Classification: 51481
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus; rubber or plastic gloves; splash goggles; rubber shoes 3.2 <b>Symptoms Following Exposure:</b> Inhalation of 500 ppm for 30 min. produces headaches, dizziness, bronchial pneumonia; 600 ppm for 30 min. can cause death. Ingestion causes severe irritation of mucous membranes and stomach. Contact with liquid causes severe burns of eyes and severe skin irritation. May be absorbed through skin and cause hydrogen sulfide poisoning. 3.3 <b>Treatment of Exposure:</b> Get medical attention following all overexposures to this compound. INHALATION: move victim to fresh air; give artificial respiration, oxygen; consult physician. INGESTION: give large amount of water. EYES OR SKIN: wash with large quantities of water for 15 min.; consult physician. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Currently not available 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 72°F C.C.  
4.2 Flammable Limits in Air: 4%-46% (hydrogen sulfide)  
4.3 Fire Extinguishing Agents: Water, dry chemical, alcohol foam  
4.4 Fire Extinguishing Agents Not to Be Used: Carbon Dioxide (Hydrogen Sulfide gas generated)  
4.5 Special Hazards of Combustion Products: Toxic hydrogen sulfide gas is released when solution is heated. If ignited, this will form irritating sulfur dioxide gas.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Currently not available  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Currently not available  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Severely corrodes copper, zinc, and their alloys  
5.3 Stability During Transport: Stable, but toxic hydrogen sulfide and ammonia gases may collect in enclosed spaces.  
5.4 Neutralizing Agents for Acids and Caustics: Dilute with water. Do not attempt to neutralize with acid.  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 100 ppm/72 hr/goldfish/killed/fresh water  
248 ppm/48 hr/mosquitofish/TL<sub>m</sub>/fresh water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical, 45-50% in water; Reagent, 52-60% in water  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Ventilated (natural)  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: B  
7.6 Ship Type: 2  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 100  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid or liquid  
9.2 Molecular Weight: 68.14 (solute)  
9.3 Boiling Point at 1 atm: 104°F = 40°C = 313°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.99-1.01 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: 95.0 Btu/lb = 52.8 cal/g = 2.21 X 10<sup>5</sup> J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES



# AMMONIUM SULFIDE

ASF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	62.420		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	55 60 65 70 75 80 85 90 95 100 105 110 115 120	7.073 7.669 8.302 8.974 9.687 10.440 11.240 12.080 12.970 13.910 14.890 15.930 17.010 18.160	55 60 65 70 75 80 85 90 95 100 105 110 115 120	0.08723 0.09367 0.10040 0.10750 0.11500 0.12280 0.13100 0.13950 0.14840 0.15770 0.16740 0.17750 0.18790 0.19880		N O T  P E R T I N E N T

# AMMONIUM SILICOFLUORIDE

ASL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium fluosilicate	Solid  White  Odorless  Sinks and mixes slowly with water.
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear dust respirator and rubber overclothing (including gloves). Avoid inhalation. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Irritating gases may be produced when heated. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $(\text{NH}_4)_2\text{SiF}_6$
- 2.3 IMO/UN Designation: 6.1/2854
- 2.4 DOT ID No.: 2854
- 2.5 CAS Registry No.: 16919-19-0
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; acid-resistant clothing and hat; rubber gloves; goggles and safety shoes
- 3.2 **Symptoms Following Exposure:** Inhalation of dust can cause pulmonary irritation and can be fatal in some cases. Ingestion may be fatal. Contact with dust causes irritation of eyes and irritation or ulceration of skin.
- 3.3 **Treatment of Exposure:** INHALATION: remove patient to fresh air. INGESTION: cause vomiting by giving soapy water or mustard water; have patient drink large quantities of lime water; if necessary, give stimulant such as strong coffee; keep patient warm. EYES: flush with water for 20 min., holding eyelids open. SKIN: wash with soap and water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 100 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Not pertinent
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen fluoride, silicon tetrafluoride, and oxides of nitrogen may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure, 99+%; Commercial, 98+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1000
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 178.14
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.0 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 85 Btu/lb = 47 cal/g = 2.0 X 10<sup>6</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# AMMONIUM SILICOFLUORIDE

ASL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	12.770		N		N		N
36	13.230		O		O		O
38	13.700		T		T		T
40	14.170						
42	14.630		P		P		P
44	15.100		E		E		E
46	15.570		R		R		R
48	16.030		T		T		T
50	16.500		I		I		I
52	16.970		N		N		N
54	17.430		E		E		E
56	17.900		N		N		N
58	18.370		E		E		E
60	18.830		N		N		N
62	19.300		T		T		T
64	19.770						
66	20.230						
68	20.700						
70	21.170						
72	21.630						
74	22.100						
76	22.570						
78	23.030						
80	23.500						
82	23.970						
84	24.430						

# AMMONIUM SULFAMATE

ASM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammate Ammonium amidosulfonate Ammonium amidosulphate AMS Sulfamic acid, monoammonium salt	Solid  White or brownish-gray  Odorless  Sinks and mixes with water.
<b>Stop discharge if possible. Keep people away. Avoid contact with solid and dust. Avoid inhalation. Isolate and remove discharged material. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{NH}_4\text{SO}_3\text{NH}_2$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 7773-06-0
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; rubber gloves.
- 3.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion causes gastrointestinal disturbances. Dust irritates eyes.
- 3.3 Treatment of Exposure: INHALATION: remove to fresh air. INGESTION: give large amount of water; get medical attention. EYES: flush with water for 15 min. SKIN: flush with water.
- 3.4 TLV-TWA: 10 mg/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; oral rat LD<sub>50</sub> = 1,600 mg/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 1,500 mg/m<sup>3</sup>
- 3.14 OSHA PEL-TWA: 15 mg/m<sup>3</sup> total dust; 5 mg/m<sup>3</sup> in respirable fraction.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fires.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 259 ppm/24 hr/catfish/LC<sub>50</sub>/fresh water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent, 99.0%; Commercial, 80%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 5000
- 8.7 EPA Pollution Category: D
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 114.13
- 9.3 Boiling Point at 1 atm: Decomposes above 200°C
- 9.4 Freezing Point: 268°F = 131°C = 404°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: > 1 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# AMMONIUM SULFAMATE

ASM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	140.199		N		N		N
36	144.400		O		O		O
38	148.699		T		T		T
40	152.900						
42	157.099		P		P		P
44	161.299		E		E		E
46	165.500		R		R		R
48	169.799		T		T		T
50	174.000		I		I		I
52	178.199		N		N		N
54	182.400		E		E		E
56	186.699		N		N		N
58	190.900		T		T		T
60	195.099						
62	199.299						
64	203.500						
66	207.799						
68	212.000						
70	216.199						
72	220.400						
74	224.699						
76	228.900						
78	233.099						
80	237.299						
82	241.500						
84	245.799						

# ASPHALT

ASP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Asphalt cements Asphaltic bitumen Bitumen Petroleum asphalt	Thick liquid (generally heated)  Dark brown to black  Tar odor  May float or sink in water. Rubbery solid is produced when cooled.
<b>Stop discharge if possible. Avoid contact with liquid. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	LIQUID Will burn skin and eyes. Flush affected areas with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. FOULING TO SHORELINE. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33; Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not pertinent  
2.3 IMO/UN Designation: 3.2/1999; 3.3/1999  
2.4 DOT ID No.: 1999  
2.5 CAS Registry No.: 8052-42-4  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 33540

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective clothing; face and eye protection when handling hot material.  
3.2 **Symptoms Following Exposure:** Contact with skin may cause dermatitis. Inhalation of vapors may cause moderate irritation of nose and throat. Hot liquid burns skin.  
3.3 **Treatment of Exposure:** Severe burns may result from contact with hot asphalt. If molten asphalt strikes the exposed skin, cool the skin immediately by quenching with cold water. A burn should be covered with a sterile dressing, and the patient should be taken immediately to a hospital.  
3.4 **TLV-TWA:** 5 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None observed  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 300°F-550°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, foam or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 400°F-700°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Each of the following is available in several grades: asphalt cement, rapid-curing liquid asphalt, medium-curing liquid asphalt, slow-curing liquid asphalt (road oil), emulsified asphalt, inverted asphaltic emulsion, oxidized (air-blown) asphalt.  
7.2 **Storage Temperature:** Elevated  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed  
8.7 **EPA Pollution Category:** Not listed  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) 1.00 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** 70 dynes/cm = 0.07 N/m at 77°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Varies

### NOTES

# ASPHALT

ASP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
67	62.420	55	0.434	175	0.970	220	93.250
		60	0.437	180	0.970	230	85.889
		65	0.439	185	0.970	240	79.299
		70	0.442	190	0.970	250	73.379
		75	0.444	195	0.970	260	68.049
		80	0.446	200	0.970	270	63.240
		85	0.449	205	0.970	280	58.880
		90	0.451	210	0.970	290	54.930
		95	0.454	215	0.970	300	51.340
		100	0.456	220	0.970	310	48.060
		105	0.458	225	0.970	320	45.080
		110	0.461	230	0.970	330	42.340
		115	0.463	235	0.970	340	39.840
		120	0.466	240	0.970	350	37.540
		125	0.468	245	0.970	360	35.420
				250	0.970	370	33.470
				255	0.970	380	31.670
				260	0.970	390	30.000

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	210	0.018		C		N
	N	220	0.026		U		O
	S	230	0.037		R		T
	O	240	0.053		R		P
	L	250	0.074		E		E
	U	260	0.103		N		R
	B	270	0.142		T		T
	L	280	0.193		L		I
	E	290	0.262		Y		N
		300	0.352				E
		310	0.470		N		N
		320	0.622		O		T
		330	0.817		T		
		340	1.067		A		
		350	1.384		V		
		360	1.783		A		
		370	2.284		I		
		380	2.909		L		
					A		
					B		
					L		
					E		

# ASPHALT BLENDING STOCKS: STRAIGHT RUN RESIDUE

ASR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carpeting medium Petroleum pitch Residual asphalt Road binder Seal-coating material	Oily liquid (generally heated)      Black      Tar odor  May float or sink in water. Rubbery solid is produced when cooled.
Avoid contact with liquid. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, foam or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. FOULING TO SHORELINE. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not pertinent  
2.3 IMO/UN Designation: 3.2/1999; 3.3/1999  
2.4 DOT ID No.: 1999  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 33540

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective clothing; eye and face protection  
3.2 **Symptoms Following Exposure:** Inhalation may cause moderate irritation of nose and throat. Skin contact may cause dermatitis.  
3.3 **Treatment of Exposure:** Severe burns may result from contact with hot asphalt. If molten asphalt strikes the exposed skin, cool the skin immediately by quenching with cold water. A burn should be covered with a sterile dressing, and the patient should be taken immediately to a hospital.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None observed  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 400-600°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 450-700°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Elevated  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed  
8.7 EPA Pollution Category: Not listed  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** 80 to 225°F = 26 to 107°C = 299 to 380°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Varies

### NOTES



# ASPHALT BLENDING STOCKS: STRAIGHT RUN RESIDUE

ASR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
250	68.660	85	0.451	175	0.970	220	93.250
252	68.660	90	0.451	180	0.970	230	85.889
254	68.660	95	0.451	185	0.970	240	79.299
256	68.660	100	0.451	190	0.970	250	73.379
258	68.660	105	0.451	195	0.970	260	68.049
260	68.660	110	0.451	200	0.970	270	63.240
262	68.660	115	0.451	205	0.970	280	58.880
264	68.660	120	0.451	210	0.970	290	54.930
266	68.660	125	0.451	215	0.970	300	51.340
268	68.660	130	0.451	220	0.970	310	48.060
270	68.660	135	0.451	225	0.970	320	45.080
272	68.660	140	0.451	230	0.970	330	42.340
274	68.660	145	0.451	235	0.970	340	39.840
276	68.660	150	0.451	240	0.970	350	37.540
278	68.660			245	0.970	360	35.420
280	68.660			250	0.970	370	33.470
282	68.660			255	0.970	380	31.670
284	68.660			260	0.970	390	30.000

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	210	0.018		N		N
	N	220	0.026		O		O
	S	230	0.037		T		T
	O	240	0.053				
	L	250	0.074		P		P
	U	260	0.103		E		E
	B	270	0.142		R		R
	L	280	0.193		T		T
	E	290	0.262		I		I
		300	0.352		N		N
		310	0.470		E		E
		320	0.622		N		N
		330	0.817		T		T
		340	1.067				
		350	1.384				
		360	1.783				
		370	2.284				
		380	2.909				

# ARSENIC TRICHLORIDE

AST

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arsenic chloride Arsenious chloride Arsenous chloride Butter of arsenic Caustic arsenic chloride Fuming liquid arsenic	Liquid  Colorless  Unpleasant odor  Sinks and reacts in water. Poisonous visible vapor cloud is produced.
<b>AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.</b> Wear goggles and self-contained breathing apparatus. Avoid inhalation. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.	
<b>Fire</b>	Not Flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula: AsCl<sub>3</sub>
- 2.3 IMO/UN Designation: 6.1/1560
- 2.4 DOT ID No.: 1560
- 2.5 CAS Registry No.: 7784-34-1
- 2.6 NAERG Guide No.: 157
- 2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety goggles and face shield; acid-type canister gas mask; rubber gloves; protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact of liquid with eyes or skin causes severe irritation. Ingestion causes weakness and severe irritation of mouth and stomach. Overdose can cause arsenic poisoning, but symptoms are delayed.
- 3.3 **Treatment of Exposure:** Get medical attention after all exposures to the compound. Be alert for arsenic poisoning symptoms. INHALATION: Remove to fresh air; give artificial respiration if needed. EYES: Flush with water for at least 15 min. SKIN: Flush with water. INGESTION: Give large amounts of water, then induce vomiting; give lime water, milk, or raw egg; give a cathartic.
- 3.4 TLV-TWA: 0.01 mg/m<sup>3</sup> as arsenic
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral rat LD<sub>50</sub> = 138 mg/kg; fatal human dose 70-180 mg, depending on weight.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Arsenic compounds may be carcinogenic.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 5 mg/m<sup>3</sup> as arsenic.
- 3.14 **OSHA PEL-TWA:** 0.01 mg/m<sup>3</sup> as arsenic.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Avoid water on adjacent fires.
- 4.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride formed when involved in fire.
- 4.6 **Behavior in Fire:** Becomes gaseous and causes irritation. Forms hydrogen chloride (hydrochloric acid) by reaction with water used on adjacent fires.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with water to generate hydrogen chloride (hydrochloric acid).
- 5.2 **Reactivity with Common Materials:**  
Corrodes metal.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 4  
Human Contact hazard: 1  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: 1
- 8.7 EPA Pollution Category: X
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 181.3
- 9.3 **Boiling Point at 1 atm:** 266.4°F = 130.2°C = 403.4°K
- 9.4 **Freezing Point:** 9°F = -13°C = 260°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.156 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** 88.31 Btu/lb = 49.06 cal/g = 2.054 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) -18 Btu/lb = -10 cal/g = -0.42 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 13.3 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ARSENIC TRICHLORIDE

AST

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
30	137.699	34	0.400	34	1.048	45	1.342
35	137.299	36	0.400	36	1.048	50	1.297
40	137.000	38	0.400	38	1.048	55	1.254
45	136.599	40	0.400	40	1.048	60	1.214
50	136.199	42	0.400	42	1.048	65	1.175
55	135.799	44	0.400	44	1.048	70	1.139
60	135.500	46	0.400	46	1.048	75	1.104
65	135.099	48	0.400	48	1.048	80	1.071
70	134.699	50	0.400	50	1.048	85	1.039
75	134.299	52	0.400	52	1.048	90	1.009
80	134.000	54	0.400	54	1.048	95	0.981
85	133.599	56	0.400	56	1.048	100	0.953
90	133.199	58	0.400	58	1.048	105	0.927
95	132.799	60	0.400	60	1.048	110	0.902
100	132.500	62	0.400	62	1.048	115	0.878
105	132.099	64	0.400	64	1.048	120	0.855
110	131.699	66	0.400	66	1.048	125	0.834
115	131.400	68	0.400	68	1.048		
120	131.000	70	0.400				
125	130.599	72	0.400				
		74	0.400				
		76	0.400				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	60	0.123	60	0.00400		N
	E	70	0.169	70	0.00539		O
	A	80	0.230	80	0.00719		T
	C	90	0.308	90	0.00948		
	T	100	0.410	100	0.01237		P
	S	110	0.540	110	0.01600		E
		120	0.703	120	0.02049		R
		130	0.909	130	0.02602		T
		140	1.164	140	0.03278		I
		150	1.479	150	0.04096		N
		160	1.864	160	0.05081		E
		170	2.333	170	0.06258		N
		180	2.899	180	0.07655		T
		190	3.579	190	0.09304		
		200	4.390	200	0.11240		
		210	5.352	210	0.13500		
		220	6.486	220	0.16120		
		230	7.818	230	0.19150		
		240	9.373	240	0.22620		
		250	11.180	250	0.26610		
		260	13.270	260	0.31140		

# AMMONIUM BISULFITE

ASU

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium hydrogen sulfite Ammonium hydrosulfite Ammonium monosulfite	Liquid solution with water  Colorless to yellow  Sinks and mixes with water.
Wear face shield or safety glasses and rubber gloves. Avoid inhalation. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. Exposure data not available. Flush affected areas with plenty of water.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed
- 2.2 Formula:  $\text{NH}_4\text{HSO}_3$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2693
- 2.5 CAS Registry No.: 10192-30-0
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Rubber gloves, face shields or safety glasses, normal protective gear.
- 3.2 Symptoms Following Exposure: Not pertinent
- 3.3 Treatment of Exposure: Call a physician. EYES: Flush with water. SKIN: Flush exposed area with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: None
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product): Currently not available
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 1
  - Human Oral hazard: 1
  - Human Contact hazard: 0
  - Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available
- 7.2 Storage Temperature: Currently not available
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material
- 8.2 49 CFR Class: 8
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	0
Instability (Yellow).....	0

- 8.6 EPA Reportable Quantity: 5000
- 8.7 EPA Pollution Category: D
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Only sold as aqueous solution.
- 9.2 Molecular Weight: 99.10
- 9.3 Boiling Point at 1 atm: Sublimates at 150°C
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.03 at room temperature (solid) 1.40 (72% aqueous solution)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Endothermic 43.6 Btu/lb = 24.2 cal/g =  $1.01 \times 10^5$  J/kg (For dilute solution 1 mole/0.300 moles  $\text{H}_2\text{O}$  which is equal to 1.833 lb/volume lb of water)
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

NOTES

# AMMONIUM BISULFITE

ASU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
50	267.000		N		N		N
55	286.610		O		O		O
60	306.221		T		T		T
65	325.832						
70	345.443		P		P		P
75	365.056		E		E		E
80	384.667		R		R		R
85	404.278		T		T		T
90	423.889		I		I		I
95	443.500		N		N		N
100	463.110		E		E		E
105	482.721		N		N		N
110	502.332		E		E		E
115	521.943		N		N		N
120	541.556		T		T		T
125	561.167						
130	580.778						
135	600.389						
140	620.000						

# ALUMINUM SULFATE SOLUTION

ASX

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless	Odorless
<b>Wear goggles, approved respirator, and rubber overclothing (including gloves).</b> <b>Avoid inhalation.</b> <b>Stop discharge if possible.</b> <b>Isolate and remove discharged material.</b> <b>Notify local health and pollution control agencies.</b>			
<b>Fire</b>	Not flammable. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Use extinguishing agents appropriate for the surrounding fire.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, may cause nausea vomiting or diarrhea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink large quantity of water. Induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intake. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 43;  
Miscellaneous Water Solutions
- 2.2 **Formula:**  $Al_2(SO_4)_3 \cdot 49H_2O$
- 2.3 **IMO/UN Designation:** Not listed.
- 2.4 **DOT ID No.:** Not listed.
- 2.5 **CAS Registry No.:** 10043-01-3
- 2.6 **NAERG Guide No.:** 154
- 2.7 **Standard Industrial Trade Classification:** 52349

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear impervious chemical protective clothing, including gloves to prevent skin contact with the liquid. Use splash-proof chemical safety goggles or face shield to prevent eye contact with liquid. Approved respirator should be used in the event of vapor concentrations.
- 3.2 **Symptoms Following Exposure:** Vapor irritates eyes, nose and respiratory tract due to formation of sulfuric acid. Ingestion of large doses causes gastric irritation, nausea, vomiting, and purging. Liquid irritates eyes and skin.
- 3.3 **Treatment of Exposure:** Call for medical aid. INHALATION: Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Give large amounts of water. Induce vomiting. EYES: Flush with water for at least 15 min., occasionally lifting lids. SKIN: Remove contaminated clothing and shoes. Flush with copious amounts of water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral rat  $LD_{50} > 5.0$  g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Data not available.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Data not available.
- 3.11 **Liquid or Solid Characteristics:** Data not available.
- 3.12 **Odor Threshold:** Data not available.
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not pertinent.
- 4.3 **Fire Extinguishing Agents:** Use extinguishing agents appropriate for the surrounding fire.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.
- 4.5 **Special Hazards of Combustion Products:** Produces sulfuric acid upon decomposition.
- 4.6 **Behavior in Fire:** Not pertinent.
- 4.7 **Auto Ignition Temperature:** Not pertinent.
- 4.8 **Electrical Hazards:** Not pertinent.
- 4.9 **Burning Rate:** Not pertinent.
- 4.10 **Adiabatic Flame Temperature:** Not pertinent.
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Not pertinent.
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:**  
Weakly corrosive to carbon steel.  
Noncorrosive to stainless steel, fiberglass, polyethylene, or polyvinyl chloride.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Cautics:** Neutralize with lime.
- 5.5 **Polymerization:** Does not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Data not available.
- 6.2 **Waterfowl Toxicity:** Data not available.
- 6.3 **Biological Oxygen Demand (BOD):**  
None.
- 6.4 **Food Chain Concentration Potential:**  
None.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades of varying concentrations.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Open.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 5000
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 1235.7
- 9.3 **Boiling Point at 1 atm:** 214°F = 101°C = 374°K
- 9.4 **Freezing Point:** 3.9°F = -15.6°C = 257.4°K
- 9.5 **Critical Temperature:** Data not available.
- 9.6 **Critical Pressure:** Data not available.
- 9.7 **Specific Gravity:** 1.29 - 1.34 at 15°C (solid)
- 9.8 **Liquid Surface Tension:** Data not available.
- 9.9 **Liquid Water Interfacial Tension:** Data not available.
- 9.10 **Vapor (Gas) Specific Gravity:** Data not available.
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Data not available.
- 9.12 **Latent Heat of Vaporization:** Data not available.
- 9.13 **Heat of Combustion:** Not pertinent.
- 9.14 **Heat of Decomposition:** Data not available.
- 9.15 **Heat of Solution:** Data not available.
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Data not available.
- 9.18 **Limiting Value:** Data not available.
- 9.19 **Reid Vapor Pressure:** Data not available.

### NOTES

# ALUMINUM SULFATE SOLUTION

ASX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
70	11.100		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	49.000		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# ACETYLACETONE

ATA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diacetylmethane 2,4-Pentanedione	Liquid  Colorless  Unpleasant Odor  Floats and mixes slowly with water. Flammable, irritating vapor is produced.
Shut off ignition sources. Call fire department. Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes. If inhaled will cause dizziness, coughing, headache, or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $\text{CH}_3\text{COCH}_2\text{COCH}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 123-54-6  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses; eye bath and safety shower; air-supplied mask for concentrations above 2%  
3.2 **Symptoms Following Exposure:** Inhalation causes dizziness, headache, nausea, vomiting and loss of consciousness. Contact with liquid irritates eyes.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; if victim is not breathing, give artificial respiration and then oxygen; call a physician. EYES or SKIN: flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 1,000 \text{ mg/kg}$  (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 105°F O.C. 93°F C.C.  
4.2 **Flammable Limits in Air:** 2.4%-11.6%  
4.3 **Fire Extinguishing Agents:** Dry chemical, "alcohol" foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective on fire.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 644°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 3.6 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May dissolve plastics  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed  
8.7 **EPA Pollution Category:** Not listed  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 100.12  
9.3 **Boiling Point at 1 atm:** 284.7°F = 140.4°C = 413.6°K  
9.4 **Freezing Point:** -10.3°F = -23.5°C = 249.7°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.975 at 20°C  
9.8 **Liquid Surface Tension:** 31.2 dynes/cm = 0.0312 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.45  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.072  
9.12 **Latent Heat of Vaporization:** 194 Btu/lb = 108 cal/g = 4.52 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -11,070 Btu/lb = -6,150 cal/g = -257 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -11.5 Btu/lb = -6.4 cal/g = -0.27 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ACETYLACETONE

ATA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	60.980	51	0.550	52	1.056	51	0.954
40	60.960	52	0.550	54	1.056	52	0.945
45	60.940	53	0.550	56	1.056	53	0.937
50	60.920	54	0.550	58	1.056	54	0.928
55	60.910	55	0.550	60	1.056	55	0.920
60	60.890	56	0.550	62	1.056	56	0.912
65	60.870	57	0.550	64	1.056	57	0.904
70	60.850	58	0.550	66	1.056	58	0.896
75	60.840	59	0.550	68	1.056	59	0.888
80	60.820	60	0.550	70	1.056	60	0.880
85	60.800	61	0.550	72	1.056	61	0.872
90	60.780	62	0.550	74	1.056	62	0.865
95	60.770	63	0.550	76	1.056	63	0.857
100	60.750	64	0.550	78	1.056	64	0.850
		65	0.550	80	1.056	65	0.842
		66	0.550	82	1.056	66	0.835
		67	0.550	84	1.056	67	0.828
		68	0.550	86	1.056	68	0.821
		69	0.550			69	0.814
		70	0.550			70	0.807
		71	0.550			71	0.800
		72	0.550			72	0.794
		73	0.550			73	0.787
		74	0.550			74	0.780
		75	0.550			75	0.774
		76	0.550			76	0.768

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	7.122	60	0.106	60	0.00190	0	0.268
36	7.444	70	0.144	70	0.00253	25	0.278
38	7.766	80	0.194	80	0.00335	50	0.289
40	8.088	90	0.258	90	0.00437	75	0.299
42	8.410	100	0.340	100	0.00566	100	0.309
44	8.733	110	0.443	110	0.00725	125	0.319
46	9.055	120	0.573	120	0.00922	150	0.328
48	9.377	130	0.734	130	0.01162	175	0.338
50	9.699	140	0.933	140	0.01452	200	0.347
52	10.020	150	1.177	150	0.01801	225	0.356
54	10.340	160	1.474	160	0.02218	250	0.365
56	10.670	170	1.832	170	0.02713	275	0.374
58	10.990	180	2.261	180	0.03297	300	0.382
60	11.310	190	2.773	190	0.03981	325	0.391
62	11.630	200	3.380	200	0.04779	350	0.399
64	11.950	210	4.096	210	0.05704	375	0.407
66	12.280	220	4.935	220	0.06772	400	0.415
68	12.600	230	5.913	230	0.07997	425	0.423
70	12.920	240	7.050	240	0.09398	450	0.430
72	13.240	250	8.363	250	0.10990	475	0.438
74	13.570	260	9.874	260	0.12800	500	0.445
76	13.890	270	11.610	270	0.14830	525	0.452
78	14.210	280	13.580	280	0.17120	550	0.459
80	14.530	290	15.820	290	0.19690	575	0.466
82	14.850	300	18.370	300	0.22550	600	0.472
84	15.180						

# ANTIMONY TRIBROMIDE

ATB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Antimonous bromide	Solid crystals  Colorless to yellow  Sinks and mixes with water.
Avoid contact with solid. Keep people away. Wear goggles, respirator, dust proof clothing, and rubber gloves. Avoid inhalation. Stop leak if possible. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID. Irritating to skin, nose, and throat. Harmful, if swallowed. Move to fresh air. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. Flush affected areas with plenty of water.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed  
2.2 **Formula:** SbBr<sub>3</sub>  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** 1549  
2.5 **CAS Registry No.:** 7789-61-9  
2.6 **NAERG Guide No.:** 157  
2.7 **Standard Industrial Trade Classification:** 52310

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Gloves, dustproof clothing, goggles, and, where atmospheric exposure is high, respirators should be used.
- 3.2 **Symptoms Following Exposure:** INHALATION: Inflammation of mucous membranes of nose and throat. SKIN: Irritation and eczematous eruption. INGESTION: Gastro intestinal upset, vomiting, diarrhea. Nervous complaints such as irritability, sleeplessness, fatigue, muscular and neurologic pain.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove from exposure. SKIN: Flush with copious amounts of water. INGESTION: Have victim drink water or milk. Induce vomiting. Perform gastric lavage.
- 3.4 **TLV-TWA:** 0.5 mg/m<sup>3</sup> as Sb.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Dryness of throat, pain on swallowing. Occasional vomiting and persistent nausea, loss of appetite, weight loss, dermatitis, dizziness, diarrhea, and bloody stools. Causes pathologic changes in cardiac muscle of experimental animals.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 50 mg/m<sup>3</sup> as Sb
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Currently not available
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Currently not available
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Decomposes in water forming SbOBr and HBr
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Decomposes in water, light, or alcohol.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 10 to 100 ppm/96 hr/\*TL<sub>m</sub>/ \* (as HBr reaction product with water)
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 0.05 mg/l (Sb<sup>+3</sup>) - no effect 0.5 mg/l (Sb<sup>+3</sup>) - slight effect 5.0 mg/l (Sb<sup>+3</sup>) - distinct effect 10th to 15th day
- 6.4 **Food Chain Concentration Potential:** Antimony can be concentrated by a factor of 300 by marine life.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1000
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 361.51
- 9.3 **Boiling Point at 1 atm:** 536°F = 280°C = 553.2°K
- 9.4 **Freezing Point:** 205.88°F = 96.6°C = 369.75°K
- 9.5 **Critical Temperature:** 1660.1°F = 904.5°C = 1177.7°K
- 9.6 **Critical Pressure:** 822.976 psia = .56 atm = 5.67 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 4.148 at 23°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** 9.7 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ANTIMONY TRIBROMIDE

ATB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT PERTINENT		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	NOT PERTINENT	201	0.020		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# ALLYLTRICHLOROSILANE

ATC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Allylsilicone trichloride	Liquid                      Colorless                      Sharp, irritating odor  Reacts violently with water. Irritating visible vapor cloud is produced.
Restrict access. Evacuate. Avoid contact with liquid and vapor. Call fire department. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Chemical and Physical Treatment:  
 Neutralize  
 Do not add water to undissolved material  
 Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula:  $\text{CH}_2=\text{CHCH}_2\text{SiCl}_3$   
 2.3 IMO/UN Designation: 8/1724  
 2.4 DOT ID No.: 1724  
 2.5 CAS Registry No.: 107-37-9  
 2.6 NAERG Guide No.: 155  
 2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Acid-vapor-type respiratory protection; rubber gloves; chemical goggles; other equipment necessary to protect skin and eyes.  
 3.2 **Symptoms Following Exposure:** Inhalation of vapor irritates mucous membranes. Liquid causes severe burns of eyes and skin and severe internal burns if ingested.  
 3.3 **Treatment of Exposure:** Get medical attention after all exposures to this compound. INHALATION: remove from exposure; support respiration. EYES: flush with water 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; give water.  
 3.4 TLV-TWA: Not listed.  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 50 to 500 mg/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations.  
 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 OSHA PEL-TWA: Not listed.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 100°F O.C. 95°F C.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam  
 4.5 **Special Hazards of Combustion Products:** Irritating vapors of hydrogen chloride and phosgene may form.  
 4.6 **Behavior in Fire:** Difficult to extinguish. Re-ignition may occur.  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** 2.2 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** Reacts vigorously, generating hydrogen chloride (hydrochloric acid).  
 5.2 **Reactivity with Common Materials:** Corrodes metal because of hydrochloric acid formed.  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: (1)  
 Human Oral hazard: (1)  
 Human Contact hazard: II  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Pressure-vacuum  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Corrosive material  
 8.2 49 CFR Class: 8  
 8.3 49 CFR Package Group: II  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	2
Special (White).....	W

 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 175.5  
 9.3 **Boiling Point at 1 atm:** 241°F = 116°C = 389°K  
 9.4 **Freezing Point:** Not pertinent  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 1.215 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** Not pertinent  
 9.10 **Vapor (Gas) Specific Gravity:** 6  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0863  
 9.12 **Latent Heat of Vaporization:** 97 Btu/lb = 54 cal/g =  $2.3 \times 10^4$  J/kg  
 9.13 **Heat of Combustion:** (est.) -5,200 Btu/lb = -2,900 cal/g =  $-120 \times 10^3$  J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Currently not available  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ALLYLTRICHLOROSILANE

ATC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	77.020	34	0.500	34	0.839	34	5.243
36	76.950	36	0.500	36	0.839	36	5.084
38	76.879	38	0.500	38	0.839	38	4.930
40	76.809	40	0.500	40	0.839	40	4.783
42	76.740	42	0.500	42	0.839	42	4.641
44	76.679	44	0.500	44	0.839	44	4.504
46	76.610	46	0.500	46	0.839	46	4.372
48	76.540	48	0.500	48	0.839	48	4.245
50	76.469	50	0.500	50	0.839	50	4.123
52	76.400	52	0.500	52	0.839	52	4.005
54	76.330	54	0.500	54	0.839	54	3.892
56	76.259	56	0.500	56	0.839	56	3.782
58	76.190	58	0.500	58	0.839	58	3.677
60	76.120	60	0.500	60	0.839	60	3.575
62	76.049	62	0.500	62	0.839	62	3.476
64	75.980	64	0.500	64	0.839	64	3.381
66	75.910	66	0.500	66	0.839	66	3.290
68	75.839	68	0.500	68	0.839	68	3.201
70	75.770	70	0.500	70	0.839	70	3.116
72	75.700	72	0.500	72	0.839	72	3.033
74	75.629	74	0.500	74	0.839	74	2.954
76	75.570	76	0.500	76	0.839	76	2.877
78	75.500	78	0.500	78	0.839	78	2.802
80	75.429	80	0.500	80	0.839	80	2.730
82	75.360	82	0.500	82	0.839	82	2.660
84	75.290	84	0.500	84	0.839	84	2.593

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	0	0.026	0	0.00091	85	0.142
	E	10	0.038	10	0.00133	90	0.142
	A	20	0.056	20	0.00189	95	0.142
	C	30	0.080	30	0.00266	100	0.142
	T	40	0.113	40	0.00369	105	0.142
	S	50	0.158	50	0.00505	110	0.142
		60	0.217	60	0.00683	115	0.142
		70	0.296	70	0.00913	120	0.142
		80	0.398	80	0.01206	125	0.142
		90	0.530	90	0.01577	130	0.142
		100	0.699	100	0.02041	135	0.142
		110	0.912	110	0.02618	140	0.142
		120	1.180	120	0.03328	145	0.142
		130	1.513	130	0.04194	150	0.142
		140	1.924	140	0.05245	155	0.142
		150	2.427	150	0.06509	160	0.142
		160	3.039	160	0.08019	165	0.142
		170	3.779	170	0.09812	170	0.142
		180	4.667	180	0.11930		
		190	5.726	190	0.14410		
		200	6.981	200	0.17300		
		210	8.462	210	0.20660		
		220	10.200	220	0.24530		
		230	12.230	230	0.28980		

# AMMONIUM THIOSULFATE

ATF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium hyposulfite	Solid or water solution  Colorless liquid or white solid  Ammonia odor  Sinks and mixes with water.
Restrict access. Keep people away. Avoid contact with liquid, solid, and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLUTION OR SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: (NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>3</sub> 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 7783-18-8 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51481
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Respirator; rubber gloves; safety glasses; face shield; rubber apron, shield, or suit as necessary to prevent skin contact 3.2 <b>Symptoms Following Exposure:</b> Inhalation of dust may irritate respiratory system. Ingestion could be harmful. Contact with eyes or skin may cause irritation. 3.3 <b>Treatment of Exposure:</b> INHALATION: move to fresh air. INGESTION: get medical attention at once. EYES: flush with plenty of water for at least 15 min. and get immediate medical attention. SKIN: wash with water. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Currently not available 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: 500 ppm as ammonia 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic ammonia, hydrogen sulfide, and oxides of nitrogen and sulfur may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable, but toxic ammonia gas may collect in enclosed spaces.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 0.62 lb/lb, 5 days
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; Analytical; Technical, 60% solution in water
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Ventilated (natural)
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid or liquid
- 9.2 **Molecular Weight:** 148.2
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# AMMONIUM THIOSULFATE

ATF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ANTHRACENE

ATH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Anthracin Green oil Paranaphthalene	Solid  White to yellow  Weak aromatic odor  Sinks in water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Dust cloud may explode if ignited in an enclosed area. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{14}H_{10}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 120-12-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Dust mask; goggles or face shield; rubber gloves  
3.2 Symptoms Following Exposure: Inhalation of dust irritates nose and throat. Contact with eyes causes irritation.  
3.3 Treatment of Exposure: INHALATION: move to fresh air. EYES: flush with water for 15 min.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 250°F  
4.2 Flammable Limits in Air: 0.6% LEL  
4.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 1004°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 78.5 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 19.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: 5 ppm/24 hr/trout & bluegill/no effect  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Various fluorescence grades; Scintillation grade; Technical grade, 90-98%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	-

  
8.6 EPA Reportable Quantity: 5000 pounds  
8.7 EPA Pollution Category: D  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 178.23  
9.3 Boiling Point at 1 atm: 646.2°F = 341.2°C = 614.4°K  
9.4 Freezing Point: 421.7°F = 216.5°C = 489.7°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.24 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: -17,100 Btu/lb = -9,510 cal/g = -398 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 38.70 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES



# ANTHRACENE

ATH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T	435 440 445 450 455 460 465 470 475 480 485 490 495 500 505 510 515 520 525 530	0.868 0.866 0.865 0.863 0.862 0.860 0.859 0.857 0.855 0.854 0.852 0.851 0.849 0.848 0.846 0.845 0.843 0.842 0.840 0.839		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# AMYL PHTHALATE

ATL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Benzenedicarboxylic acid, dipentyl ester Dipentyl phthalate Phthalic acid, diarmyl ester Phthalic acid, dipentyl ester	Liquid                      Colorless                      Odorless  Floats on water.
Keep people away. Shut off ignition sources. Call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible Water and foam may be ineffective on fire. Extinguish with dry chemicals or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, coughing, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Dilute and disperse  
 Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Esters  
 2.2 Formula:  $C_{11}H_{14}O_4$   
 2.3 IMO/UN Designation: Not listed  
 2.4 DOT ID No.: Not listed  
 2.5 CAS Registry No.: 131-18-0  
 2.6 NAERG Guide No.: Not listed  
 2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves  
 3.2 **Symptoms Following Exposure:** Inhalation of vapors from very hot material may cause headache, drowsiness, and convulsions. Hot vapors may irritate eyes.  
 3.3 **Treatment of Exposure:** INHALATION: Move to fresh air. EYES: Flush with water. SKIN: Wipe off; flush with water; wash with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2;  $TD_{50} = 2.2$  g/kg (rat)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Causes birth defects in rats (skeletal and gross abnormalities)  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 245°F C.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
 4.5 **Special Hazards of Combustion Products:** Currently not available  
 4.6 **Behavior in Fire:** Currently not available  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 111.9 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 32.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** May attack some forms of plastics  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 306.4  
 9.3 **Boiling Point at 1 atm:** 631°F = 333°C = 606°K  
 9.4 **Freezing Point:** Currently not available  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.82 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 31.5 dynes/cm = 0.0315 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** 10.5  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** 140 Btu/lb = 76 cal/g =  $3.2 \times 10^5$  J/kg  
 9.13 **Heat of Combustion:** 13,900 Btu/lb = - 7,720 cal/g =  $- 323 \times 10^3$  J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### NOTES

# AMYL PHTHALATE

ATL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	51.190		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190	32.483 29.311 26.536 24.087 21.910 19.963 18.210 16.624 15.182 13.866 12.659 11.549 10.524 9.576 8.695 7.874 7.109 6.392 5.721 5.090 4.497 3.937 3.408 2.908 2.434

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.010	125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001	125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250	0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00001 0.00001 0.00001 0.00001 0.00002 0.00002 0.00002 0.00003 0.00003 0.00003 0.00004 0.00004 0.00004 0.00004 0.00005 0.00005 0.00005	C U R R E N T L Y  N O T  A V A I L A B L E	

# ANTIMONY TRICHLORIDE

ATM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Antimony (III) chloride Butter of antimony	Solid  White to pale yellow  Sharp unpleasant odor  Sinks and mixes violently with water.
<b>Restrict access.</b> <b>Evacuate.</b> <b>AVOID CONTACT WITH SOLID AND DUST.</b> <b>Wear dust respirator and rubber overclothing (including gloves).</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Irritating gases may be produced when heated. Wear goggles and self-contained breathing apparatus. DO NOT USE WATER ON ADJACENT FIRES.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause coughing, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Chemical and Physical Treatment: Neutralize Do not add water to undissolved material	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: SbCl <sub>3</sub> 2.3 IMO/UN Designation: 8/1733 2.4 DOT ID No.: 1733 2.5 CAS Registry No.: 10025-91-9 2.6 NAERG Guide No.: 157 2.7 Standard Industrial Trade Classification: 52329
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Note: The respiratory system is the chief avenue of entrance of antimony and its compounds into the body. Bu. Mines approved respirator; chemical safety goggles; face shield; leather or rubber safety shoes; rubber apron; rubber gloves <b>3.2 Symptoms Following Exposure:</b> Inhalation of small amounts may cause only irritation of the nose, throat and air passages; large exposures result in severe air-passage irritation. Ingestion causes vomiting, purging with bloody stools, slow pulse and low blood pressure; slow, shallow breathing; coma and convulsions sometimes followed by death. Contact with eyes causes severe eye burns or at least severe eye irritation. Contact of dry chemical with skin may result in deep chemical burns. <b>3.3 Treatment of Exposure:</b> INHALATION: move victim at once to fresh air and keep him warm, but not hot; call a physician immediately; nasal passages may be irrigated from a gently flowing hose. INGESTION: induce vomiting by giving large quantities of warm salt water; have a physician see the patient at once. EYES: flush with copious amounts of water for at least 15 min.; call a physician at once. SKIN: flush with large quantities of flowing water followed by washing of skin surfaces with soap and water; remove all contaminated clothing promptly. <b>3.4 TLV-TWA:</b> 0.5 mg/m <sup>3</sup> (as antimony) <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; oral rat LD <sub>50</sub> = 675 mg/kg <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Currently not available <b>3.11 Liquid or Solid Characteristics:</b> Currently not available <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> 50 mg/m <sup>3</sup> as Sb <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:**  
Not flammable
- 4.2 Flammable Limits in Air:** Not flammable
- 4.3 Fire Extinguishing Agents:** Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used:** Do not use water on adjacent fires.
- 4.5 Special Hazards of Combustion**  
**Products:** Toxic and irritating antimony oxide and hydrogen chloride may form in fires.
- 4.6 Behavior in Fire:** Currently not available
- 4.7 Auto Ignition Temperature:** Not pertinent
- 4.8 Electrical Hazards:** Not pertinent
- 4.9 Burning Rate:** Not pertinent
- 4.10 Adiabatic Flame Temperature:** Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 Flame Temperature:** Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** Reacts vigorously to form a strong solution of hydrochloric acid.
- 5.2 Reactivity with Common Materials:**  
Corrodes most metals in presence of moisture. Flammable hydrogen gas may collect in enclosed spaces.
- 5.3 Stability During Transport:** Stable
- 5.4 Neutralizing Agents for Acids and Caustics:** Large amounts of water followed by sodium bicarbonate or soda ash solution
- 5.5 Polymerization:** Not pertinent
- 5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
17 ppm\*/96 hr/fathead minnow/TL<sub>50</sub>/ fresh (hard) water  
9 ppm\*/96 hr/fathead minnow/TL<sub>50</sub>/ fresh (soft) water  
\*as antimony
- 6.2 Waterfowl Toxicity:** Currently not available
- 6.3 Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 Food Chain Concentration Potential:**  
High
- 6.5 GESAMP Hazard Profile:**  
**Bioaccumulation:** 0  
**Damage to living resources:** 2  
**Human Oral hazard:** 1  
**Human Contact hazard:** II  
**Reduction of amenities:** XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Commercial, 99+%; Analytical; Anhydrous
- 7.2 Storage Temperature:** Ambient
- 7.3 Inert Atmosphere:** Padded
- 7.4 Venting:** Pressure-vacuum
- 7.5 IMO Pollution Category:** Currently not available
- 7.6 Ship Type:** Currently not available
- 7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Corrosive material
- 8.2 49 CFR Class:** 8
- 8.3 49 CFR Package Group:** II
- 8.4 Marine Pollutant:** No
- 8.5 NFPA Hazard Classification:** Not listed
- 8.6 EPA Reportable Quantity:** 1000 pounds
- 8.7 EPA Pollution Category:** C
- 8.8 RCRA Waste Number:** Not listed
- 8.9 EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Solid
- 9.2 Molecular Weight:** 228
- 9.3 Boiling Point at 1 atm:** 433°F = 223°C = 496°K
- 9.4 Freezing Point:** 163°F = 73°C = 346°K
- 9.5 Critical Temperature:** Not pertinent
- 9.6 Critical Pressure:** Not pertinent
- 9.7 Specific Gravity:** 3.14 at 20°C (solid)
- 9.8 Liquid Surface Tension:** Not pertinent
- 9.9 Liquid Water Interfacial Tension:** Not pertinent
- 9.10 Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 Latent Heat of Vaporization:** Not pertinent
- 9.13 Heat of Combustion:** Not pertinent
- 9.14 Heat of Decomposition:** Not pertinent
- 9.15 Heat of Solution:** -70 Btu/lb = -39 cal/g = -1.6 X 10<sup>5</sup> J/kg
- 9.16 Heat of Polymerization:** Not pertinent
- 9.17 Heat of Fusion:** 13.3 cal/g
- 9.18 Limiting Value:** Currently not available
- 9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# ANTIMONY TRICHLORIDE

ATM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S	235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335	0.415 0.466 0.523 0.586 0.655 0.731 0.815 0.907 1.008 1.119 1.240 1.372 1.516 1.674 1.845 2.031 2.234 2.453 2.691 2.948 3.226	235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335	0.01269 0.01416 0.01577 0.01753 0.01947 0.02158 0.02389 0.02640 0.02915 0.03213 0.03536 0.03887 0.04268 0.04680 0.05125 0.05606 0.06124 0.06682 0.07283 0.07929 0.08623		N O T  P E R T I N E N T

# ACETONITRILE

ATN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cyanomethane Ethanenitrile Ethyl nitrile Methyl cyanide	Watery liquid  Colorless  Sweet odor  Floats and mixes with water. Flammable, irritating vapor is produced.
<b>Restrict access.</b> <b>Wear goggles and self-contained breathing apparatus.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 37; Nitriles  
2.2 Formula: CH<sub>3</sub>CN  
2.3 IMO/UN Designation: 3/1648  
2.4 DOT ID No.: 1648  
2.5 CAS Registry No.: 75-05-8  
2.6 NAERG Guide No.: 131  
2.7 Standard Industrial Trade Classification: 51484

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained breathing apparatus
- 3.2 **Symptoms Following Exposure:** Exposure to 160 ppm for 4 hours causes flushing of the face and a feeling of constriction in the chest; 500 ppm for brief periods is irritating to the nose and throat. Severe exposures cause irritability, skin eruptions, confusion, delirium, convulsions, paralysis, and death due to central nervous system depression.
- 3.3 **Treatment of Exposure:** Remove victim from contaminated atmosphere. Give artificial respiration and oxygen if respiration is impaired.
- 3.4 **TLV-TWA:** 40 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 60 ppm.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50-500 mg/kg (guinea pig)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Not pertinent
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. Effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 40 ppm
- 3.13 **IDLH Value:** 500 ppm
- 3.14 **OSHA PEL-TWA:** 40 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 42°F O.C.
- 4.2 **Flammable Limits in Air:** 4.4%-16%
- 4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective
- 4.5 **Special Hazards of Combustion Products:** Toxic vapors are generated when heated
- 4.6 **Behavior in Fire:** Vapor heavier than air and may travel a considerable distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 975°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 2.7 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 17.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 4.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 1150 ppm/24 hr/fathead minnow/TL<sub>50</sub>/hard water
- 6.2 **Waterfowl Toxicity:** Not pertinent
- 6.3 **Biological Oxygen Demand (BOD):** 17%, 5 days
- 6.4 **Food Chain Concentration Potential:** None noted
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** III
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** U003
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 41.05
- 9.3 **Boiling Point at 1 atm:** 179°F = 81.6°C = 354.8°K
- 9.4 **Freezing Point:** -50.3°F = -45.7°C = 227.5°K
- 9.5 **Critical Temperature:** 526.5°F = 274.7°C = 547.9°K
- 9.6 **Critical Pressure:** 701 pisa = 47.7 atm = 4.83 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.787 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 1.4
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.192
- 9.12 **Latent Heat of Vaporization:** 313 Btu/lb = 174 cal/g = 7.29 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -13,360 Btu/lb = -7420 cal/g = -310.7 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.02 psia

### NOTES

# ACETONITRILE

ATN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-40	52.920	52	0.540		N		N
-30	52.540	54	0.540		O		O
-20	52.160	56	0.540		T		T
-10	51.790	58	0.540				
0	51.410	60	0.540		P		P
10	51.030	62	0.540		E		E
20	50.650	64	0.540		R		R
30	50.260	66	0.540		T		T
40	49.880	68	0.540		I		I
50	49.500	70	0.540		N		N
60	49.120	72	0.540		E		E
70	48.730	74	0.540		N		N
80	48.350	76	0.540		T		T
90	47.970	78	0.540				
100	47.580	80	0.540				
110	47.200	82	0.540				
120	46.810	84	0.540				
130	46.420	86	0.540				
140	46.040						
150	45.650						
160	45.260						
170	44.870						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	10	0.209	10	0.00170	0	0.280
	I	20	0.298	20	0.00237	25	0.287
	S	30	0.417	30	0.00326	50	0.295
	C	40	0.575	40	0.00440	75	0.303
	I	50	0.781	50	0.00586	100	0.310
	B	60	1.046	60	0.00770	125	0.317
	L	70	1.383	70	0.00996	150	0.324
	E	80	1.805	80	0.01279	175	0.332
		90	2.329	90	0.01620	200	0.338
		100	2.972	100	0.02031	225	0.345
		110	3.755	110	0.02521	250	0.352
		120	4.699	120	0.03100	275	0.359
		130	5.829	130	0.03780	300	0.365
		140	7.169	140	0.04572	325	0.372
		150	8.747	150	0.05487	350	0.378
		160	10.590	160	0.06538	375	0.384
		170	12.740	170	0.07737	400	0.390
		180	15.220	180	0.09097	425	0.396
		190	18.060	190	0.10630	450	0.402
		200	21.310	200	0.12350	475	0.408
		210	25.000	210	0.14280	500	0.414
		220	29.170	220	0.16410	525	0.419
		230	33.870	230	0.18780	550	0.425
						575	0.430
						600	0.435

# ARSENIC TRIOXIDE

ATO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arsenic sesquioxide Arsenous acid Arsenous acid anhydride Arsenous oxide White arsenic	Solid crystals or powder  White  Odorless  Sinks and mixes slowly with water.
<b>Restrict access.</b> <b>AVOID CONTACT WITH SOLID AND DUST.</b> Stay upwind. Use water spray to "knock down" dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: As<sub>2</sub>O<sub>3</sub>  
2.3 IMO/UN Designation: 6.1/1561  
2.4 DOT ID No.: 1561  
2.5 CAS Registry No.: 1327-53-3  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Bureau of Mines approved respirator; protective gloves, eye protection; full protective coveralls.  
3.2 **Symptoms Following Exposure:** Ingestion causes irritation of mucous membrane, weakness, loss of appetite, gastrointestinal disturbances. Overdose can cause arsenic poisoning, but symptoms are delayed.  
3.3 **Treatment of Exposure:** Get medical attention after all exposures to this compound. Be alert for arsenic poisoning symptoms. SKIN: Wash thoroughly with soap and water; remove contaminated clothing and shower with soap and water; irritations, except for milder cases which disappear in a day or two, should have medical attention. INGESTION: Vomiting should be induced and a physician should be called at once; drink freely of lime water, sweet milk, or raw eggs, followed by castor oil or any brisk cathartic.  
3.4 **TLV-TWA:** 0.01 mg/m<sup>3</sup> as arsenic  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; oral mouse LD<sub>50</sub> = 45 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Arsenic compounds may be carcinogenic.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 5 mg/m<sup>3</sup> as arsenic.  
3.14 **OSHA PEL-TWA:** 0.01 mg/m<sup>3</sup> as arsenic.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic fumes of arsenic trioxide and arsine may be formed in fire situations.  
4.6 **Behavior in Fire:** May volatilize and form toxic fumes of arsenic trioxide.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Not pertinent  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Not pertinent  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
5.3 mg/l/8 days/salmon/harmful/\*  
\*Type of water not specified  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 4  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Refined: 99%; Crude: 95%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1 pound  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** P012  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 197.8  
9.3 **Boiling Point at 1 atm:** 855°F = 457°C = 730°K  
9.4 **Freezing Point:** 599°F = 315°C = 588°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 3.7 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 22.2 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ARSENIC TRIOXIDE

ATO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.328		N		N		N
36	0.405		O		O		O
38	0.483		T		T		T
40	0.561						
42	0.639		P		P		P
44	0.716		E		E		E
46	0.794		R		R		R
48	0.872		T		T		T
50	0.950		I		I		I
52	1.028		N		N		N
54	1.105		E		E		E
56	1.183		N		N		N
58	1.261		E		E		E
60	1.339		N		N		N
62	1.417		T		T		T
64	1.494						
66	1.572						
68	1.650						
70	1.728						
72	1.805						
74	1.883						
76	1.961						
78	2.039						
80	2.117						
82	2.194						
84	2.272						

# AMMONIUM TARTRATE

ATR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Tartaric acid, ammonium salt		Solid	White	Odorless
		Sinks and mixes with water.		
<b>Keep people away.</b> <b>Call fire department.</b> <b>Avoid contact with solid and dust.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>				
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $(\text{NH}_4)_2\text{C}_4\text{H}_4\text{O}_6$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 14307-43-8
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 51391

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Contact with solid may irritate eyes.
- 3.3 Treatment of Exposure: EYES: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent (combustible solid)
- 4.2 Flammable Limits in Air: Not pertinent
- 4.3 Fire Extinguishing Agents: Water
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion  
Products: Toxic oxides of nitrogen or ammonia gas may form in fires.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Analytical; Pure
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 5000 pounds
- 8.7 EPA Pollution Category: D
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 184
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.60 at 25°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# AMMONIUM TARTRATE

ATR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	46.000		N		N		N
36	47.000		O		O		O
38	48.000		T		T		T
40	49.000						
42	50.000		P		P		P
44	51.000		E		E		E
46	52.000		R		R		R
48	53.000		T		T		T
50	54.000		I		I		I
52	55.000		N		N		N
54	56.000		E		E		E
56	57.000		N		N		N
58	58.000		E		E		E
60	59.000		N		N		N
62	60.000		T		T		T
64	61.000						
66	62.000						
68	63.000						
70	64.000						
72	65.000						
74	66.000						
76	67.000						
78	68.000						
80	69.000						
82	70.000						
84	71.000						

# N-AMYLTRICHLOROSILANE

ATS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Pentylsilicon trichloride Trichloroamylsilane Trichloropentylsilane	Liquid  Colorless  Sharp irritating odor  Reacts violently with water. Irritating visible vapor cloud is produced.
<b>Restrict access.</b> <b>Evacuate.</b> <b>Avoid contact with liquid and vapor.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Chemical and Physical Treatment: Neutralize Do not add water to undissolved material Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{SiCl}_3$ 2.3 IMO/UN Designation: 8/1728 2.4 DOT ID No.: 1728 2.5 CAS Registry No.: 107-72-2 2.6 NAERG Guide No.: 155 2.7 Standard Industrial Trade Classification: 51550
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Acid-vapor-type respiratory protection; rubber gloves; chemical worker's goggles. 3.2 <b>Symptoms Following Exposure:</b> Inhalation causes irritation of mucous membrane. Contact of liquid with eyes or skin causes severe burns, and ingestion causes severe burns of mouth and stomach. 3.3 <b>Treatment of Exposure:</b> Get medical attention immediately after exposure to this compound. INHALATION: remove from exposure; support respiration. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: give large amounts of water. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; oral rat $\text{LD}_{50}$ = 2,340 mg/kg 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 3.11 <b>Liquid or Solid Characteristics:</b> Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 145°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam  
4.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride and toxic phosgene may be formed.  
4.6 **Behavior in Fire:** Difficult to extinguish. Re-ignition may occur.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 2.5 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously to generate toxic hydrogen chloride gas (hydrochloric acid).  
5.2 **Reactivity with Common Materials:** Corrodes metal  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** After flushing with water, rinse with sodium bicarbonate solution or lime water.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	2
Special (White).....	W

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCL List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 205.6  
9.3 **Boiling Point at 1 atm:** 320°F = 160°C = 433°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.137 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 7.1  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** (est.) 86.8 Btu/lb = 48.2 cal/g = 2.02 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -6,630 Btu/lb = -3,680 cal/g = -154 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) 180 Btu/lb = 100 cal/g = 4.0 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# N-AMYLTRICHLOROSILANE

ATS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
51	71.879	51	0.436	52	0.783	51	9.018
52	71.839	52	0.436	54	0.783	52	8.773
53	71.809	53	0.437	56	0.783	53	8.535
54	71.770	54	0.437	58	0.783	54	8.305
55	71.740	55	0.438	60	0.783	55	8.082
56	71.700	56	0.438	62	0.783	56	7.865
57	71.669	57	0.439	64	0.783	57	7.656
58	71.629	58	0.439	66	0.783	58	7.452
59	71.599	59	0.440	68	0.783	59	7.255
60	71.559	60	0.441	70	0.783	60	7.064
61	71.530	61	0.441	72	0.783	61	6.879
62	71.490	62	0.442	74	0.783	62	6.699
63	71.459	63	0.442	76	0.783	63	6.524
64	71.419	64	0.443	78	0.783	64	6.355
65	71.389	65	0.443	80	0.783	65	6.190
66	71.360	66	0.444	82	0.783	66	6.031
67	71.320	67	0.444	84	0.783	67	5.876
68	71.290	68	0.445	86	0.783	68	5.726
69	71.250	69	0.446	88	0.783	69	5.580
70	71.219	70	0.446			70	5.438
71	71.179	71	0.447			71	5.301
72	71.150	72	0.447			72	5.167
73	71.110	73	0.448			73	5.037
74	71.080	74	0.448			74	4.911
75	71.040	75	0.449			75	4.789
76	71.009	76	0.449			76	4.670

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	70	0.403	70	0.01459		N
	E	80	0.496	80	0.01762		O
	A	90	0.607	90	0.02114		T
	C	100	0.736	100	0.02518		P
	T	110	0.886	110	0.02980		E
	S	120	1.061	120	0.03505		R
		130	1.262	130	0.04099		T
		140	1.493	140	0.04768		I
		150	1.756	150	0.05516		N
		160	2.055	160	0.06351		E
		170	2.392	170	0.07277		N
		180	2.772	180	0.08300		T
		190	3.198	190	0.09427		
		200	3.673	200	0.10660		
		210	4.201	210	0.12020		
		220	4.786	220	0.13490		
		230	5.432	230	0.15090		
		240	6.143	240	0.16820		
		250	6.923	250	0.18690		
		260	7.777	260	0.20700		
		270	8.707	270	0.22860		
		280	9.720	280	0.25170		
		290	10.820	290	0.27640		
		300	12.010	300	0.30270		
		310	13.290	310	0.33070		
		320	14.670	320	0.36040		

# ANTIMONY TRIFLUORIDE

ATT

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid crystals      White      Odorless

Sinks in water.

Avoid contact with solid.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.

#### SOLID

Irritating to skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: SbF<sub>3</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 1549
- 2.5 CAS Registry No.: 7783-56-4
- 2.6 NAERG Guide No.: 157
- 2.7 Standard Industrial Trade Classification: 52310

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, rubber gloves.
- 3.2 **Symptoms Following Exposure:** Resemble those of lead and arsenic poisoning. ACUTE POISONING: Irritation of the mouth, nose, stomach and intestines; vomiting, purging with bloody stools; slow pulse and low blood pressure; slow, shallow breathing; coma and convulsions sometimes followed by death from cardiac and respiratory exhaustion. CHRONIC POISONING: dryness of throat; pain on swallowing; occasional vomiting and persistent nausea; susceptibility to fainting; diarrhea, loss of appetite and weight; giddiness; dermatitis, either pustular or ulcerative; anemia
- 3.3 **Treatment of Exposure:** If any symptoms, however slight, are noticed, the affected individual should be removed from contact with the chemical and placed under the care of a physician who is versed in the treatment necessary.
- 3.4 **TLV-TWA:** 0.5 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg (guinea pig)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 50 mg/m<sup>3</sup> as Sb
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 200 ppm/<24 hr/tinca vulgaris (fish)/killed/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 178.75
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** 558°F = 292°C = 565°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 4.38 at 21°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# ANTIMONY TRIFLUORIDE

ATT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	389.699		N		N		N
36	394.500		O		O		O
38	399.299		T		T		T
40	404.099						
42	408.799		P		P		P
44	413.599		E		E		E
46	418.399		R		R		R
48	423.199		T		T		T
50	427.899		I		I		I
52	432.699		N		N		N
54	437.500		E		E		E
56	442.299		N		N		N
58	447.099		T		T		T
60	451.799						
62	456.599						
64	461.399						
66	466.199						
68	470.899						
70	475.699						
72	480.500						
74	485.299						
76	490.099						
78	494.799						
80	499.599						
82	504.399						
84	509.199						

# AMMONIUM THIOSULFATE SOLUTION (60% OR LESS)

ATV

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium hyposulfite solution Ammonium hypo solution	Liquid	Colorless	Odorless
<b>Restrict access.</b> <b>Wear chemical protective gloves and goggles.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Use extinguishing agents appropriate for the surrounding fire.		
<b>Exposure</b>	CALL FOR MEDICAL AID. SOLUTION Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water and induce vomiting.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 43;
- 2.2 **Miscellaneous Water Solutions**
- 2.3 **Formula:** (NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub>O<sub>5</sub>
- 2.4 **IMO/UN Designation:** Not listed.
- 2.5 **DOT ID No.:** Not listed.
- 2.6 **CAS Registry No.:** 7783-18-8
- 2.7 **NAERG Guide No.:** Not listed
- 2.8 **Standard Industrial Trade Classification:** 52344

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear chemical protective gloves to prevent contact with solution. Use splash-proof chemical goggles or face shield to prevent splashes from contacting the eyes.
- 3.2 **Symptoms Following Exposure:** Contact with eyes may cause eye irritation with discomfort, tearing, or blurring of vision. Contact with skin may cause irritation with discomfort or rash.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Move to fresh air. INGESTION: Give victim two glasses of water and induce vomiting. EYES: Flush with plenty of water for at least 15 min., lifting lids occasionally. SKIN: Flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 2.85 g/kg.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable.
- 4.2 **Flammable Limits in Air:** Not pertinent.
- 4.3 **Fire Extinguishing Agents:** Use extinguishing agents appropriate for the surrounding fire.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.
- 4.5 **Special Hazards of Combustion Products:** Toxic ammonia, hydrogen sulfide, and oxides of nitrogen and sulfur may form in fires.
- 4.6 **Behavior in Fire:** Not pertinent.
- 4.7 **Auto Ignition Temperature:** Not pertinent.
- 4.8 **Electrical Hazards:** Not pertinent.
- 4.9 **Burning Rate:** Not pertinent.
- 4.10 **Adiabatic Flame Temperature:** Not pertinent.
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent.
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, water solutions of varying concentrations.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** Ventilated (natural).
- 7.4 **Venting:** Open.
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	0
Instability (Yellow).....	1
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Reacts with strong oxidizers such as chlorates, nitrates, and nitrites to release toxic ammonia, hydrogen sulfide, and sulfur trioxide gases.
- 5.3 **Stability During Transport:** Stable, but toxic ammonia gas may collect in enclosed spaces.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 148.2
- 9.3 **Boiling Point at 1 atm:** 122°F = 50°C = 323°K
- 9.4 **Freezing Point:** 50°F = 10°C = 283°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.33 at 16°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** <1
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Not pertinent.
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 0.62 lb/lb, 5 days (As the salt).
- 6.4 **Food Chain Concentration Potential:** None.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### NOTES



# AMMONIUM THIOSULFATE SOLUTION (60% OR LESS)

ATV

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	11.099		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	68 77 100	0.348 3.578 6.092	68 77 100	0.00910 0.09200 0.15025		C U R R E N T L Y  N O T  A V A I L A B L E

# ANTIMONY TRIOXIDE

ATX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diantimony trioxide Exitelite Flowers of antimony Senamontite Valentinite Weisspiessglanz	Solid  White  Odorless   Sinks in water.
<b>Restrict access.</b> <b>AVOID CONTACT WITH SOLID AND DUST.</b> Wear dust respirator and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause coughing, difficult breathing or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. If swallowed will cause dizziness, nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Sb<sub>2</sub>O<sub>3</sub>  
2.3 IMO/UN Designation: 6.1/1549  
2.4 DOT ID No.: 1549  
2.5 CAS Registry No.: 1309-64-4  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; safety goggles; dust mask  
3.2 **Symptoms Following Exposure:** Inhalation causes inflammation of upper and lower respiratory tract, including pneumonitis. Ingestion causes irritation of the mouth, nose, stomach and intestines; vomiting, purging with bloody stools; slow pulse and low blood pressure; slow, shallow breathing; coma and convulsions sometimes followed by death. Contact with eyes causes conjunctivitis. Contact with skin causes dermatitis and rhinitis.  
3.3 **Treatment of Exposure:** If any of the symptoms of poisoning, even slight, are noticed, the affected individual should be removed from contact with the chemical and placed under care of a physician. INGESTION: induce vomiting. EYES: flush with water for at least 15 min. SKIN: wash well with soap and water.  
3.4 **TLV-TWA:** 0.5 mg/m<sup>3</sup> (as antimony)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 0; oral rat LD<sub>50</sub> = 20,000 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 50 mg/m<sup>3</sup> as Sb  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Not pertinent  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Not pertinent  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
>80 ppm/96 hr/fathead minnow/TL<sub>50</sub>/ hard or soft fresh water  
\*as antimony  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** High  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent, 99.9+%; Optical grade  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 291.50  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 5.2 at 25°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 46.3 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ANTIMONY TRIOXIDE

ATX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ATRAZINE

ATZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aatrex herbicide 2-Chloro-4-ethylamino-6-Isopropylamino-s-triazine		Solid crystals      White  Sinks in water.
Restrict access. <b>AVOID CONTACT WITH SOLID AND DUST.</b> <b>KEEP PEOPLE AWAY.</b> Wear goggles and self-contained breathing apparatus. Stay upwind. Use water spray to "knock down" dust. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.	
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>6</sub>H<sub>9</sub>N<sub>3</sub>Cl  
2.3 IMO/UN Designation: 6.1/1609  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 1912-24-9  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 59110

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Dust mask; goggles; rubber gloves.  
3.2 **Symptoms Following Exposure:** Irritates eyes and skin. If ingested, irritates mouth and stomach.  
3.3 **Treatment of Exposure:** EYES: flush with copious amounts of water for 15 min. SKIN: wash with large amounts of water. INGESTION: no specific antidote; induce vomiting and give a saline laxative and supportive therapy.  
3.4 **TLV-TWA:** 5 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 3080 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** No reaction  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride and toxic oxides of nitrogen may be formed.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
12.6 mg/l/48 hr/rainbow trout/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** >2000 mg/kg LD<sub>50</sub>  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Various grades, 70-80%. Mixtures with sodium chlorate and sodium metaborate.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 215.7  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** 347°F = 175°C = 348°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) 1.2 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -9,500 Btu/lb = -5,300 cal/g = -220 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ATRAZINE

ATZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# TERT-AMYL ACETATE

AYA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> tert-Pentyl acetate	Watery liquid Colorless to yellow Banana odor  Floats on water. Flammable, irritating vapor is produced.
Restrict access. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR. Irritating to eyes, nose, and throat. If inhaled, will cause nausea, headache, or dizziness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $\text{CH}_3\text{COOC}(\text{CH}_2)_4\text{C}_2\text{H}_5$   
2.3 IMO/UN Designation: 3.3/1104  
2.4 DOT ID No.: 1104  
2.5 CAS Registry No.: 625-16-1  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, chemical goggles or face shield, and lab coat.  
Organic vapor chemical cartridge respirator for less than 1000 ppm; self-contained breathing apparatus for greater than 1000 ppm.
- 3.2 **Symptoms Following Exposure:** INHALATION AND INGESTION: Irritates the mucous membrane, depresses the central nervous system and is narcotic. Damage to kidney, liver, and lung can occur. Ingestion may irritate gastro-intestinal tract. EYES: Irritation. SKIN: Irritation.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove from exposure. Administer oxygen if needed. EYES: Flush with water for at least 15 min. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. Subsequent treatment is symptomatic and supportive in nature.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 0.08 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
(est) 79°F C.C.
- 4.2 **Flammable Limits in Air:** 1.00%-7.5%
- 4.3 **Fire Extinguishing Agents:** Water fog in conjunction with alcohol foam, dry chemical or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** When heated emits acrid fumes.
- 4.6 **Behavior in Fire:** When exposed to flames can react vigorously with oxidizing material.
- 4.7 **Auto Ignition Temperature:** (est) 715°F.
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 45.2 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Not pertinent
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
65 ppm/96 hr/mosquito fish/TL<sub>m</sub>/turbid water.  
120 ppm/48 hr/daphnia/TL<sub>m</sub>/24°C.  
53 ppm/24 hr/brine shrimp/TL<sub>m</sub>.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 53%, 5 days 62%, 10 days 70%, 15 days 80%, 20 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Data not available
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 130.18
- 9.3 **Boiling Point at 1 atm:** 256.5°F = 124.7°C = 397.9°K
- 9.4 **Freezing Point:** >-148°F = >-100°C = > 173°K
- 9.5 **Critical Temperature:** (est.) 609°F = 320.7°C = 593.9°K
- 9.6 **Critical Pressure:** 395 psia = 26.9 atm = 2.73 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.874 at 19°C
- 9.8 **Liquid Surface Tension:** (est.) 29.2 dynes/cm = 0.0292 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** 43.8 dynes/cm = 0.0438 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** 4.5
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) > 1 - 1.1
- 9.12 **Latent Heat of Vaporization:** (est.) 126.6 Btu/lb = 70.3 cal/g = 2.94 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** (est.) -14,402 Btu/lb = -8000 cal/g = -334.9 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TERT-AMYL ACETATE

AYA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	54.552	20	0.702	68	7.158	609	0.028
60	54.213						
70	53.874						
80	53.535						
90	53.195						
100	52.856						
110	52.517						
120	52.178						
130	51.839						
140	51.500						
150	51.160						
160	50.821						
170	50.482						
180	50.143						
190	49.804						
200	49.465						
210	49.125						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		20	-1.194	55	0.00346	68	34.580
		30	-1.747	60	0.00394		
		40	-0.300	65	0.00449		
		50	-0.853	70	0.00511		
		60	0.593	75	0.00582		
		70	0.040	80	0.00662		
		80	0.513	85	0.00754		
		90	1.066	90	0.00858		
		100	1.620	95	0.00977		
		110	2.173	100	0.01113		
		120	2.726	105	0.01267		
		130	3.279	110	0.01442		
		140	3.833	115	0.01642		
		150	4.386	120	0.01869		
		160	4.939				
		170	5.492				
		180	6.045				
		190	6.599				
		200	7.152				
		210	7.705				
		220	8.258				
		230	8.812				
		240	9.365				
		250	9.918				

# AZINPHOS METHYL

AZM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> O,O-Dimethyl s-[(4-oxo-1,2,3-benzotriazine-3-(4h)-yl)methyl]phosphorodithioate Gusathion insecticide Guthion insecticide	Solid                      Brown  Sinks in water.
Restrict access. <b>AVOID CONTACT WITH SOLID AND DUST.</b> Wear goggles and self-contained breathing apparatus. Stay upwind. Use water spray to "knock down" dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 <b>CG Compatibility Group:</b> Not listed. 2.2 <b>Formula:</b> C <sub>10</sub> H <sub>12</sub> N <sub>2</sub> O <sub>3</sub> PS <sub>2</sub> 2.3 <b>IMO/UN Designation:</b> 6.1/2783 2.4 <b>DOT ID No.:</b> 2783 2.5 <b>CAS Registry No.:</b> 86-50-0 2.6 <b>NAERG Guide No.:</b> 152 2.7 <b>Standard Industrial Trade Classification:</b> 59110
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Dust mask; protective goggles; rubber gloves. 3.2 <b>Symptoms Following Exposure:</b> Dust irritates eyes. Inhalation or ingestion causes sweating, constriction of pupils of eyes, asthmatic symptoms, cramps, weakness, convulsions, collapse. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove to fresh air; keep warm; call doctor. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. INGESTION: get medical attention at once; give water slurry of charcoal; do NOT give milk or alcohol. 3.4 <b>TLV-TWA:</b> 0.2 mg/m <sup>3</sup> 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 4; oral rat LD <sub>50</sub> = 11-18.5 mg/kg 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 10 mg/m <sup>3</sup> 3.14 <b>OSHA PEL-TWA:</b> 0.2 mg/m <sup>3</sup> 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Oxides of sulfur and phosphorus may be formed when in fire situation.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.005 mg/l/96 hr/bluegill/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** 136 mg/kg LD<sub>50</sub>
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; 50% wettable powder; water emulsions
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 317
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** 163°F = 73°C = 346°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.4 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -8,600 Btu/lb = -4,800 cal/g = -200 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# AZINPHOS METHYL

AZM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.001		N		N		N
36	0.001		O		O		O
38	0.001		T		T		T
40	0.001						
42	0.001		P		P		P
44	0.001		E		E		E
46	0.002		R		R		R
48	0.002		T		T		T
50	0.002		I		I		I
52	0.002		N		N		N
54	0.002		E		E		E
56	0.002		N		N		N
58	0.002		E		E		E
60	0.003		N		N		N
62	0.003		T		T		T
64	0.003						
66	0.003						
68	0.003						
70	0.003						
72	0.003						
74	0.004						
76	0.004						
78	0.004						
80	0.004						
82	0.004						
84	0.004						

# BROMOACETYL BROMIDE

BAB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bromoethanoyl bromide	Liquid  Colorless to light yellow  Sharp, extremely irritating  Reacts violently with water. Irritating vapor is produced.
Avoid contact with liquid and vapor. Keep people away. Wear goggles and self-contained breathing apparatus. Evacuate. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. DO NOT USE WATER ON ADJACENT FIRES. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{BrCH}_2\text{CO}_2\text{Br}$   
2.3 IMO/UN Designation: 8/2513  
2.4 DOT ID No.: 2513  
2.5 CAS Registry No.: 598-21-0  
2.6 NAERG Guide No.: 156  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Acid-type canister mask; self-contained breathing apparatus (full face); rubber gloves and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory system. External contact causes severe irritation of eyes and skin. Ingestion causes severe irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: Remove from exposure; support respiration, call physician. SKIN: Wash with large amounts of water; treat burns as required. INGESTION: Do NOT induce vomiting; give large amounts of water, call a physician.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available.
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating, such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not flammable
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water on adjacent fires.
- 4.5 **Special Hazards of Combustion Products:** Heat of fire can cause decomposition, with evolution of highly toxic and irritating hydrogen bromide and bromophosgene vapors.
- 4.6 **Behavior in Fire:** Highly irritating (tear gas) vapors released when heated. Hydrogen bromide gas is released if in contact with water.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously to generate hydrogen bromide (hydrobromic acid).
- 5.2 **Reactivity with Common Materials:** Will react with surface moisture to generate hydrogen bromide, which is corrosive to metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: (2)  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material
- 8.2 49 CFR Class: 8
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: Not listed. Not listed.
- 8.7 EPA Pollution Category: Not listed. Not listed.
- 8.8 RCRA Waste Number: Not listed Not listed
- 8.9 EPA FWPCA List: Not listed Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 201.85
- 9.3 **Boiling Point at 1 atm:** 298°F = 148°C = 421°K
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 2.317 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Not Listed
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BROMOACETYL BROMIDE

BAB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
71	144.650		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.092 0.094 0.096 0.098 0.100 0.102 0.103 0.105 0.107 0.109 0.111 0.113 0.115 0.117 0.119 0.120 0.122 0.124 0.126 0.128 0.130 0.132 0.134 0.136 0.137

# BORIC ACID

BAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Boracic acid Orthoboric acid	Solid  White  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $H_2BO_3$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 10043-35-3
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52235

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical goggles; chemical resistant gloves and clothing.
- 3.2 **Symptoms Following Exposure:** Although no adverse effects have been reported from inhaling boric acid dust, it is absorbed through mucous membranes. Ingestion of 5 grams or more may irritate gastrointestinal tract and affect central nervous system. Contact with dust or aqueous solutions may irritate eyes; no chronic effects have been recognized, but continued contact should be avoided. Dust and solutions are absorbed through burns and open wounds but not through unbroken skin.
- 3.3 **Treatment of Exposure:** INHALATION: remove from contaminated atmosphere. INGESTION: obtain medical attention as soon as possible; if the patient is conscious, induce vomiting by giving warm salty water (2 tablespoons of table salt to a pint of water) or warm soapy water; if this measure is unsuccessful, vomiting may be induced by tickling the back of the patient's throat with a finger; vomiting should be encouraged about three times or until the vomitus is clear; additional water may be given to wash out the stomach. EYES: immediately flush the eyes with large quantities of running water for a minimum of 15 min.; hold the eyelids apart during the irrigation to ensure flushing of the entire surface of the eye and lids with water; obtain medical attention as soon as possible; continue the irrigation for an additional 15 min. if the physician is not available. SKIN: immediately flush affected area with water; remove contaminated clothing under the shower; continue washing with water-do not attempt to neutralize with chemical agents; obtain medical attention unless burn is minor.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; oral rat  $LD_{50} = 5.14$  g/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Dry skin, eruptions, gastric disturbances.
- 3.10 Vapor (Gas) Irritant Characteristics: Lesions on mucous membranes.
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Water fog.
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 1800 ppm/24 hr/mosquito fish/TL<sub>w</sub>/fresh water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Radio, 99.98%; Technical, 99.9%; N.F., 99.5%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 61.83
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.435 at 20.0°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution:  $-157$  Btu/lb =  $-87$  cal/g =  $-3.7 \times 10^2$  J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# BORIC ACID

BAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	2.822		N O T		N O T		N O T
36	2.944						
38	3.066						
40	3.189						
42	3.311						
44	3.433		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
46	3.555						
48	3.678						
50	3.800						
52	3.922						
54	4.044						
56	4.166						
58	4.289						
60	4.411						
62	4.533						
64	4.655						
66	4.778						
68	4.900						
70	5.022						
72	5.144						
74	5.266						
76	5.389						
78	5.511						
80	5.633						
82	5.755						
84	5.878						

# ISO-BUTYRALDEHYDE

BAD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isobutylaldehyde Isobutyraldehyde Isobutyric aldehyde 2-Methylpropanal	Watery liquid      Colorless      Pleasant gasoline-like odor  Floats and mixes slowly with water. Flammable, irritating vapor is produced.
Restrict access. Avoid contact with liquid and vapor. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin. Will burn eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Contain  
 Collection Systems: Skim  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 19; Aldehydes  
 2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>CHCHO  
 2.3 IMO/UN Designation: 3.2/2045  
 2.4 DOT ID No.: 1129  
 2.5 CAS Registry No.: 78-84-2  
 2.6 NAERG Guide No.: 129  
 2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Appropriate protective clothing, including rubber gloves, rubber shoes and protective eyewear.  
 3.2 **Symptoms Following Exposure:** Vapor is irritating to the eyes and mucous membranes.  
 3.3 **Treatment of Exposure:** EYES: immediately flush with plenty of water for at least 15 min.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 mg/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** 0.047 ppm  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 13°F O.C.  
 -40°F C.C.  
 4.2 **Flammable Limits in Air:** 2.0%-10.0%  
 4.3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back. Fires are difficult to control due to ease of reignition.  
 4.7 **Auto Ignition Temperature:** 385°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 4.8 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** 162 lb/lb in 5 days  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: T  
 Damage to living resources: 2  
 Human Oral hazard:  
 Human Contact hazard:  
 Reduction of amenities: I

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Dry grade: 98.0% wet grade: 96.0%; commercial: 97%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Pressure-vacuum  
 7.5 **IMO Pollution Category:** C  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	1

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 72.11  
 9.3 **Boiling Point at 1 atm:** 147°F = 64.1°C = 337.3°K  
 9.4 **Freezing Point:** -112°F = -80°C = 193°K  
 9.5 **Critical Temperature:** 464.0°F = 240°C = 513.2°K  
 9.6 **Critical Pressure:** 600 psia = 41 atm = 4.2 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.791 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 22.0 dynes/cm = 0.0220 N/m at 24°C  
 9.9 **Liquid Water Interfacial Tension:** 7.2 dynes/cm = 0.0072 N/m at 22.7°C  
 9.10 **Vapor (Gas) Specific Gravity:** 2.5  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.093  
 9.12 **Latent Heat of Vaporization:** 180 Btu/lb = 98 cal/g = 4.1 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -13,850 Btu/lb = -7693 cal/g = -322.1 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 5.0 psia

### NOTES

# ISO-BUTYRALDEHYDE

BAD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	50.570	-55	0.486	99	0.879	45	0.563
40	50.380	-50	0.487	100	0.878	50	0.542
45	50.190	-45	0.489	101	0.877	55	0.522
50	50.000	-40	0.490	102	0.876	60	0.504
55	49.810	-35	0.491	103	0.875	65	0.486
60	49.620	-30	0.493	104	0.874	70	0.469
65	49.430	-25	0.494	105	0.873	75	0.454
70	49.240	-20	0.495	106	0.872	80	0.439
75	49.050	-15	0.497	107	0.871	85	0.425
80	48.860	-10	0.498	108	0.870	90	0.411
85	48.670	-5	0.500	109	0.869	95	0.398
90	48.470	0	0.501	110	0.868	100	0.386
95	48.280	5	0.502	111	0.867	105	0.374
100	48.090	10	0.504	112	0.866	110	0.363
105	47.900	15	0.505	113	0.865	115	0.353
110	47.710	20	0.507	114	0.864		
115	47.520	25	0.508	115	0.863		
120	47.330	30	0.509	116	0.862		
125	47.140	35	0.511	117	0.861		
130	46.950	40	0.512	118	0.860		
135	46.760	45	0.513	119	0.859		
140	46.570	50	0.515	120	0.858		
		55	0.516	121	0.857		
		60	0.518	122	0.856		
		65	0.519	123	0.855		
		70	0.520	124	0.854		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	6.500	40	1.242	40	0.01670	0	0.288
		50	1.649	50	0.02173	25	0.301
		60	2.160	60	0.02792	50	0.314
		70	2.794	70	0.03544	75	0.326
		80	3.574	80	0.04449	100	0.339
		90	4.523	90	0.05527	125	0.351
		100	5.666	100	0.06800	150	0.363
		110	7.031	110	0.08291	175	0.374
		120	8.648	120	0.10020	200	0.386
		130	10.550	130	0.12020	225	0.397
		140	12.770	140	0.14300	250	0.408
		150	15.340	150	0.16900	275	0.419
		160	18.300	160	0.19840	300	0.430
		170	21.690	170	0.23140	325	0.441
		180	25.550	180	0.26830	350	0.451
		190	29.920	190	0.30930	375	0.461
		200	34.840	200	0.35480	400	0.471
		210	40.360	210	0.40480	425	0.481
						450	0.491
						475	0.500
						500	0.509
						525	0.518
						550	0.527
						575	0.536
						600	0.545

# ISO-BUTYL ACRYLATE

BAI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acrylic acid, isobutyl ester isobutyl 2-propenoate	Watery liquid      Colorless      Sharp fragrant odor  Floats on water. Irritating vapor is produced.
Restrict access. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 14; Acrylates  
 2.2 **Formula:** CH<sub>2</sub>=CHCOOCH<sub>2</sub>CH(CH<sub>3</sub>)<sub>2</sub>  
 2.3 **IMO/UN Designation:** Currently not available  
 2.4 **DOT ID No.:** Not listed  
 2.5 **CAS Registry No.:** 106-63-8  
 2.6 **NAERG Guide No.:** 129P  
 2.7 **Standard Industrial Trade Classification:** 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber gloves, chemical goggles.
- 3.2 **Symptoms Following Exposure:** Moderate toxicity when swallowed. Contact with the eyes causes minor irritation no worse than that caused by hand soap.
- 3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air at once; give oxygen if breathing is difficult or artificial respiration if breathing has stopped; call a doctor. INGESTION: make victim vomit by sticking a finger down the throat or by giving strong, warm salt water to drink; get medical attention. SKIN AND EYES: remove chemical by flushing with plenty of clean, running water; remove contaminated clothing and wash exposed skin with soap and water.
- 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available.  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 94°F O.C.  
 4.2 **Flammable Limits in Air:** 1.9%-8.0%  
 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 644°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 4.8 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Will polymerize when hot. Uncontrolled bulk polymerization can be explosive.  
 5.6 **Inhibitor of Polymerization:** Methyl ether of hydroquinone: 10-60 ppm  
 Hydroquinone: 5 ppm

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** Currently not available  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 3  
 Human Oral hazard: 1  
 Human Contact hazard: II  
 Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.0%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Pressure-vacuum  
 7.5 **IMO Pollution Category:** B  
 7.6 **Ship Type:** 2  
 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 128.17  
 9.3 **Boiling Point at 1 atm:** 280.2°F = 137.9°C = 411.1°K  
 9.4 **Freezing Point:** -78.0°F = -61.1°C = 212.1°K  
 9.5 **Critical Temperature:** 599.0°F = 315°C = 588.2°K  
 9.6 **Critical Pressure:** 440 psia = 30 atm = 3.0 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.889 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 2.47 dynes/cm = 0.0247 N/m at 25°C  
 9.9 **Liquid Water Interfacial Tension:** (est.) 35 dynes/cm = 0.035 N/m at 27°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.044  
 9.12 **Latent Heat of Vaporization:** 130 Btu/lb = 71 cal/g = 3.0 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -13,500 Btu/lb = -7500 cal/g = -314 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** -229 Btu/lb = -127 cal/g = -5.32 X 10<sup>5</sup> J/kg  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 0.4 psia

### NOTES



# ISO-BUTYL ACRYLATE

BAI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	56.640	35	0.412	45	1.067	35	1.130
40	56.460	40	0.414	50	1.063	40	1.077
45	56.290	45	0.417	55	1.059	45	1.028
50	56.120	50	0.420	60	1.056	50	0.981
55	55.940	55	0.423	65	1.052	55	0.938
60	55.770	60	0.425	70	1.048	60	0.897
65	55.600	65	0.428	75	1.044	65	0.858
70	55.420	70	0.431	80	1.040	70	0.822
75	55.250	75	0.434	85	1.036	75	0.789
80	55.080	80	0.437	90	1.032	80	0.757
85	54.900	85	0.439	95	1.029	85	0.727
90	54.730	90	0.442	100	1.025	90	0.698
95	54.560	95	0.445	105	1.021	95	0.672
100	54.380	100	0.448	110	1.017	100	0.646
105	54.210	105	0.450	115	1.013	105	0.623
110	54.040	110	0.453	120	1.009	110	0.600
115	53.860	115	0.456	125	1.005	115	0.579
120	53.690	120	0.459	130	1.002	120	0.558
				135	0.998		
				140	0.994		
				145	0.990		
				150	0.986		
				155	0.982		
				160	0.978		
				165	0.975		
				170	0.971		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.200	35	0.086	35	0.00207	0	0.336
		40	0.099	40	0.00236	25	0.348
		45	0.114	45	0.00269	50	0.359
		50	0.130	50	0.00305	75	0.371
		55	0.149	55	0.00346	100	0.382
		60	0.170	60	0.00390	125	0.393
		65	0.193	65	0.00440	150	0.403
		70	0.219	70	0.00494	175	0.414
		75	0.248	75	0.00554	200	0.424
		80	0.280	80	0.00620	225	0.434
		85	0.316	85	0.00692	250	0.444
		90	0.355	90	0.00771	275	0.454
		95	0.398	95	0.00858	300	0.464
		100	0.446	100	0.00952	325	0.473
		105	0.499	105	0.01055	350	0.483
		110	0.556	110	0.01166	375	0.492
		115	0.619	115	0.01287	400	0.501
		120	0.688	120	0.01417	425	0.509
		125	0.763	125	0.01559	450	0.518
		130	0.845	130	0.01711	475	0.526
		135	0.934	135	0.01875	500	0.535
		140	1.031	140	0.02052	525	0.543
		145	1.136	145	0.02242	550	0.551
		150	1.249	150	0.02446	575	0.558
		155	1.372	155	0.02665	600	0.566
		160	1.504	160	0.02898		

# BENZYL ALCOHOL

BAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzenecarbinol alpha-Hydroxytoluene Phenylcarbinol Phenylmethanol Phenylmethyl alcohol	Liquid  Colorless  Mild, pleasant odor  May float or sink in water.
<b>Restrict access.</b> <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> <b>Wear rubber overclothing (including gloves).</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemicals or carbon dioxide. Water or foam may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, coughing, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. <b>MAY BE READILY ABSORBED THROUGH THE SKIN.</b> Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 <b>CG Compatibility Group:</b> Not listed. 2.2 <b>Formula:</b> C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> OH 2.3 <b>IMO/UN Designation:</b> Not listed 2.4 <b>DOT ID No.:</b> Not listed 2.5 <b>CAS Registry No.:</b> 100-51-6 2.6 <b>NAERG Guide No.:</b> Not listed 2.7 <b>Standard Industrial Trade Classification:</b> 51235
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Neoprene gloves; chemical safety goggles 3.2 <b>Symptoms Following Exposure:</b> Inhalation of vapor may cause irritation of upper respiratory tract. Prolonged or excessive inhalation may result in headache, nausea, vomiting, and diarrhea. In severe cases, respiratory stimulation followed by respiratory and muscular paralysis, convulsions, narcosis and death may result. Ingestion may produce severe irritation of the gastrointestinal tract, followed by nausea, vomiting, cramps and diarrhea; tissue ulceration may result. Contact with eyes causes local irritation. Material can be absorbed through skin with anesthetic or irritant effect. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove victim from contaminated atmosphere; call physician immediately. INGESTION: induce vomiting and contact a physician. EYES: flush with plenty of water for 15 min. and contact a physician. SKIN: flush with water, wash with soap and water; obtain medical attention in case of irritation or central nervous system depression. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; oral rat LD <sub>50</sub> = 1,230 mg/kg 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> 5.5 ppm 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 220°F O.C. 213°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** "Alcohol" foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 817°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 3.74 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Avoid contact with strong acids and oxidizers. Will attack some plastics.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 360 ppm/48 hr/daphnia magna/TL<sub>50</sub>/\*  
\*Water type not specified.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 155%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 2/BOD  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: 1

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** NF; Photographic; Technical; Textile  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 108.13  
9.3 **Boiling Point at 1 atm:** 401°F = 205°C = 478°K  
9.4 **Freezing Point:** 4.5°F = -15.3°C = 257.9°K  
9.5 **Critical Temperature:** 757.4°F = 403°C = 676.2°K  
9.6 **Critical Pressure:** 663 psia = 45.0 atm = 4.57 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.050 at 15/15°C (liquid)  
9.8 **Liquid Surface Tension:** 39.0 dynes/cm = 0.0390 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.73  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.070  
9.12 **Latent Heat of Vaporization:** 193 Btu/lb = 107 cal/g = 4.48 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -14,850 Btu/lb = -8,260 cal/g = -345 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 19.83 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# BENZYL ALCOHOL

BAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	66.410	34	0.520	34	1.088	60	9.245
36	66.339	36	0.520	36	1.088	70	7.678
38	66.270	38	0.520	38	1.088	80	6.420
40	66.200	40	0.520	40	1.088	90	5.404
42	66.129	42	0.520	42	1.088	100	4.577
44	66.059	44	0.520	44	1.088	110	3.899
46	65.990	46	0.520	46	1.088	120	3.340
48	65.919	48	0.520	48	1.088	130	2.876
50	65.860	50	0.520	50	1.088	140	2.489
52	65.790	52	0.520	52	1.088	150	2.164
54	65.719	54	0.520	54	1.088	160	1.890
56	65.650	56	0.520	56	1.088	170	1.658
58	65.580	58	0.520	58	1.088	180	1.460
60	65.509	60	0.520	60	1.088	190	1.291
62	65.440	62	0.520	62	1.088	200	1.146
64	65.370	64	0.520	64	1.088	210	1.021
66	65.299	66	0.520	66	1.088		
68	65.230	68	0.520	68	1.088		
70	65.160			70	1.088		
72	65.089			72	1.088		
74	65.020			74	1.088		
76	64.950			76	1.088		
78	64.879						
80	64.809						
82	64.750						
84	64.679						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	2.555	180	0.102	180	0.00161	0	0.247
36	2.611	190	0.138	190	0.00213	20	0.257
38	2.667	200	0.184	200	0.00281	40	0.266
40	2.722	210	0.243	210	0.00366	60	0.276
42	2.778	220	0.319	220	0.00473	80	0.285
44	2.833	230	0.416	230	0.00607	100	0.294
46	2.889	240	0.537	240	0.00773	120	0.302
48	2.944	250	0.689	250	0.00978	140	0.311
50	3.000	260	0.878	260	0.01229	160	0.320
52	3.055	270	1.111	270	0.01534	180	0.328
54	3.111	280	1.398	280	0.01903	200	0.336
56	3.167	290	1.747	290	0.02347	220	0.344
58	3.222	300	2.171	300	0.02879	240	0.352
60	3.278	310	2.683	310	0.03511	260	0.360
62	3.333	320	3.297	320	0.04259	280	0.368
64	3.389	330	4.030	330	0.05141	300	0.375
66	3.444	340	4.903	340	0.06176	320	0.383
68	3.500	350	5.935	350	0.07384	340	0.390
70	3.555	360	7.151	360	0.08788	360	0.397
72	3.611	370	8.578	370	0.10410	380	0.404
74	3.667	380	10.250	380	0.12290	400	0.411
76	3.722	390	12.190	390	0.14450	420	0.418
78	3.778	400	14.430	400	0.16910	440	0.425
80	3.833	410	17.030	410	0.19730		
82	3.889						
84	3.944						

# N-BUTYLAMINE

**BAM**

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Aminobutane Butylamine Mono-n-Butylamine Norvalamine	Liquid  Colorless  Fishy, ammonia-like odor  Mixes with water.
<b>Restrict access.</b> <b>Evacuate.</b> <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</b> <b>Shut off ignition sources. Call fire department.</b> <b>Stay upwind. Use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause dizziness, headache, coughing, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** T; Aliphatic amines  
**2.2 Formula:** CH<sub>3</sub>(CH<sub>2</sub>)<sub>3</sub>NH<sub>2</sub>  
**2.3 IMO/UN Designation:** 3.2/1125  
**2.4 DOT ID No.:** Not listed  
**2.5 CAS Registry No.:** 109-73-9  
**2.6 NAERG Guide No.:** 132  
**2.7 Standard Industrial Trade Classification:** 51489

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Air-supplied mask; rubber gloves; coverall goggles; face shield; butyl rubber apron  
**3.2 Symptoms Following Exposure:** Inhalation causes irritation, nausea, vomiting, headache, faintness, severe coughing and chest pains; can cause lung edema. Ingestion causes severe irritation of mouth and stomach. Contact with eyes causes severe irritation and edema of the cornea. Contact with skin causes burns; absorption through skin may cause nausea, vomiting and shock.  
**3.3 Treatment of Exposure:** INHALATION: remove victim to fresh air; call a physician; give oxygen if breathing is difficult; if not breathing, give artificial respiration. INGESTION: give large amounts of water; get medical attention. EYES: flush with water at least 15 min.; get medical care. SKIN: remove contaminated clothing; flush skin with plenty of water at least 15 min.  
**3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** 5 ppm.  
**3.7 Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 500 mg/kg (rat)  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Currently not available  
**3.11 Liquid or Solid Characteristics:** Currently not available  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** 300 ppm  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** 5 ppm.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 30°F O.C. 10°F C.C.  
**4.2 Flammable Limits in Air:** 1.7%-9.8%  
**4.3 Fire Extinguishing Agents:** "Alcohol" foam, dry chemical, carbon dioxide  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
**4.5 Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.  
**4.6 Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back. Containers may explode in fire.  
**4.7 Auto Ignition Temperature:** 594°F  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** 5.79 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 36.9 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 10.5 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** May corrode some metals in presence of water.  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Flush with water  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** 30-70 ppm/24 hr/creek chub/critical range/fresh water  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** 26.5% theo., 5 days  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Pure, 100%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester)  
**7.5 IMO Pollution Category:** C  
**7.6 Ship Type:** 2  
**7.7 Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed  
**8.2 49 CFR Class:** Not pertinent  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** 1000 pounds  
**8.7 EPA Pollution Category:** C  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 73.14  
**9.3 Boiling Point at 1 atm:** 171.3°F = 77.4°C = 350.6°K  
**9.4 Freezing Point:** -56°F = -49°C = 224°K  
**9.5 Critical Temperature:** 483.8°F = 251°C = 524.2°K  
**9.6 Critical Pressure:** 603 psia = 41 atm = 4.16 MN/m<sup>2</sup>  
**9.7 Specific Gravity:** 0.741 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** 53.11 dynes/cm = 0.05311 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** Not pertinent  
**9.10 Vapor (Gas) Specific Gravity:** 2.5  
**9.11 Ratio of Specific Heats of Vapor (Gas):** (est.) 1.071  
**9.12 Latent Heat of Vaporization:** 180 Btu/lb = 100 cal/g = 4.2 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -17,595 Btu/lb = -9,775 cal/g = -409.0 X 10<sup>3</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** -137 Btu/lb = -76.2 cal/g = -3.19 X 10<sup>5</sup> J/kg  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 1.39 psia

### NOTES

# N-BUTYLAMINE

BAM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
30	47.450	45	0.595		N	51	0.850
35	47.280	50	0.598		O	52	0.842
40	47.120	55	0.600		T	53	0.835
45	46.950	60	0.602			54	0.827
50	46.780	65	0.604		P	55	0.820
55	46.620	70	0.606		E	56	0.813
60	46.460	75	0.608		R	57	0.805
65	46.290	80	0.610		T	58	0.798
70	46.130	85	0.612		I	59	0.791
75	45.970	90	0.614		N	60	0.784
80	45.800	95	0.616		E	61	0.777
85	45.640	100	0.618		N	62	0.771
90	45.480	105	0.621		T	63	0.764
95	45.320	110	0.623			64	0.757
100	45.160	115	0.625			65	0.751
105	45.000	120	0.627			66	0.744
110	44.840	125	0.629			67	0.738
115	44.680	130	0.631			68	0.732
120	44.520					69	0.726
125	44.360					70	0.719
130	44.200					71	0.713
135	44.040					72	0.707
140	43.880					73	0.702
145	43.730					74	0.696
150	43.570					75	0.690
						76	0.684

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	35	0.609	35	0.00838	50	0.400
	I	40	0.710	40	0.00969	100	0.427
	S	45	0.826	45	0.01115	150	0.453
	C	50	0.957	50	0.01279	200	0.479
	I	55	1.104	55	0.01462	250	0.503
	B	60	1.270	60	0.01666	300	0.527
	L	65	1.457	65	0.01892	350	0.550
	E	70	1.665	70	0.02142	400	0.573
		75	1.898	75	0.02418	450	0.594
		80	2.156	80	0.02722	500	0.615
		85	2.443	85	0.03056	550	0.635
		90	2.761	90	0.03422	600	0.655
		95	3.111	95	0.03822	650	0.673
		100	3.497	100	0.04258	700	0.691
		105	3.921	105	0.04732	750	0.708
		110	4.386	110	0.05246	800	0.725
		115	4.895	115	0.05804	850	0.740
		120	5.451	120	0.06407	900	0.755
		125	6.056	125	0.07057	950	0.770
		130	6.714	130	0.07758	1000	0.783
		135	7.428	135	0.08511	1050	0.796
		140	8.202	140	0.09319	1100	0.808
		145	9.039	145	0.10190	1150	0.819
		150	9.942	150	0.11110		
		155	10.920	155	0.12100		
		160	11.960	160	0.13150		

# N-BUTYL ALCOHOL

**BAN**

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butanol 1-Butanol Butyl alcohol 1-Hydroxybutane n-Propylcarbinol	Watery liquid  Colorless  Alcohol odor  Floats and mixes slowly with water. Flammable, irritating vapor is produced.
<b>Restrict access. Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	<b>FLAMMABLE</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical or carbon dioxide. Water and alcohol foam may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause nausea, headache, dizziness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 20; Alcohols, glycols  
**2.2 Formula:** CH<sub>3</sub>(CH<sub>2</sub>)<sub>3</sub>CH<sub>2</sub>OH  
**2.3 IMO/UN Designation:** 3.3/1120  
**2.4 DOT ID No.:** 1120  
**2.5 CAS Registry No.:** 71-36-3  
**2.6 NAERG Guide No.:** 129  
**2.7 Standard Industrial Trade Classification:** 51213

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Organic vapor canister or air-supplied mask; chemical goggles or face splash shield.  
**3.2 Symptoms Following Exposure:** Anesthesia, nausea, headache, dizziness, irritation of respiratory passages. Mildly irritating to the skin and eyes.  
**3.3 Treatment of Exposure:** INHALATION: remove from exposure immediately; call a physician; if breathing is irregular or has stopped, start resuscitation and administer oxygen. INGESTION: induce vomiting and call a physician. EYES: flush with water for at least 15 minutes.  
**3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** 50 ppm; Notice of Intended Change: 25 ppm  
**3.7 Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** None  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
**3.12 Odor Threshold:** 25 ppm  
**3.13 IDLH Value:** 1,400 ppm  
**3.14 OSHA PEL-TWA:** 100 ppm  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 97°F O.C. 84°F C.C.  
**4.2 Flammable Limits in Air:** 1.4%-11.2%  
**4.3 Fire Extinguishing Agents:** Carbon dioxide, dry chemicals  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Not pertinent  
**4.7 Auto Ignition Temperature:** 650°F  
**4.8 Electrical Hazards:** Class I, Group D  
**4.9 Burning Rate:** 3.2 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** 1000 ppm/24 hr/goldfish/died/fresh water  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** 1.1-1.92 lb/lb, 5 days; 157%, 5 days  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 99+%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester)  
**7.5 IMO Pollution Category:** D  
**7.6 Ship Type:** Data not available  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid  
**8.2 49 CFR Class:** 3  
**8.3 49 CFR Package Group:** II  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** 5000 pounds  
**8.7 EPA Pollution Category:** D  
**8.8 RCRA Waste Number:** U031  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 74.12  
**9.3 Boiling Point at 1 atm:** 243.9°F = 117.7°C = 390.9°K  
**9.4 Freezing Point:** -129°F = -89.3°C = 183.9°K  
**9.5 Critical Temperature:** 553.6°F = 289.8°C = 563°K  
**9.6 Critical Pressure:** 640.2 psia = 43.55 atm = 4.412 MN/m<sup>2</sup>  
**9.7 Specific Gravity:** 0.810 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** 24.6 dynes/cm = .0246 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** (est.) 56 dynes/cm = 0.056 N/m at 27°C  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** 1.083  
**9.12 Latent Heat of Vaporization:** 256 Btu/lb = 142 cal/g = 5.95 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -14,230 Btu/lb = -7906 cal/g = -331.0 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** 29.93 cal/g  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 0.3 psia

### NOTES

# N-BUTYL ALCOHOL

BAN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
15	51.840	55	0.537	45	1.053	55	3.570
20	51.720	60	0.544	50	1.049	60	3.303
25	51.600	65	0.552	55	1.045	65	3.060
30	51.480	70	0.559	60	1.040	70	2.840
35	51.360	75	0.566	65	1.036	75	2.639
40	51.240	80	0.573	70	1.032	80	2.455
45	51.120	85	0.580	75	1.028	85	2.287
50	51.000	90	0.588	80	1.024	90	2.134
55	50.880	95	0.595	85	1.020	95	1.993
60	50.760	100	0.602	90	1.016	100	1.864
65	50.640	105	0.609	95	1.012	105	1.745
70	50.520	110	0.617	100	1.008	110	1.636
75	50.400	115	0.624	105	1.004	115	1.535
80	50.270	120	0.631	110	1.000	120	1.442
85	50.150	125	0.638	115	0.996	125	1.356
90	50.030	130	0.645	120	0.992	130	1.277
95	49.900	135	0.653	125	0.988	135	1.204
100	49.780	140	0.660	130	0.984	140	1.135
105	49.660	145	0.667			145	1.072
110	49.530	150	0.674			150	1.013
115	49.410	155	0.682			155	0.958
120	49.280	160	0.689			160	0.908
125	49.160	165	0.696			165	0.860
130	49.030	170	0.703			170	0.816
135	48.910	175	0.710			175	0.774
140	48.780						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	7.800	55	0.049	55	0.00065	0	0.318
		60	0.060	60	0.00080	25	0.330
		65	0.074	65	0.00098	50	0.342
		70	0.092	70	0.00119	75	0.354
		75	0.112	75	0.00145	100	0.365
		80	0.137	80	0.00175	125	0.377
		85	0.167	85	0.00211	150	0.388
		90	0.202	90	0.00254	175	0.399
		95	0.244	95	0.00304	200	0.410
		100	0.294	100	0.00362	225	0.420
		105	0.352	105	0.00431	250	0.431
		110	0.421	110	0.00511	275	0.441
		115	0.502	115	0.00604	300	0.452
		120	0.597	120	0.00711	325	0.462
		125	0.708	125	0.00836	350	0.472
		130	0.836	130	0.00979	375	0.481
		135	0.985	135	0.01144	400	0.491
		140	1.158	140	0.01333	425	0.500
		145	1.357	145	0.01550	450	0.510
		150	1.587	150	0.01797	475	0.519
		155	1.850	155	0.02078	500	0.528
						525	0.537
						550	0.545
						575	0.554
						600	0.562

# SEC-BUTYL ALCOHOL

BAS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Butanol Butylene hydrate 2-Hydroxybutane Methyl ethyl carbinol	Watery liquid      Colorless      Alcohol odor  Floats and mixes slowly with water. Flammable, irritating vapor is produced.
Restrict access. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to eyes. If in eyes, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohols, glycols  
 2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$   
 2.3 IMO/UN Designation: 3.3/1120  
 2.4 DOT ID No.: 1120  
 2.5 CAS Registry No.: 78-92-2  
 2.6 NAERG Guide No.: 129  
 2.7 Standard Industrial Trade Classification: 51213

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor canister or air-supplied mask; chemical goggles or face splash shield.  
 3.2 **Symptoms Following Exposure:** Headache, dizziness, and respiratory irritation. Liquid is severely irritating to the eyes and may cause eyeburn.  
 3.3 **Treatment of Exposure:** INHALATION: remove from exposure immediately; call a physician; if breathing is irregular or has stopped, start resuscitation and administer oxygen. INGESTION: induce vomiting and call a physician. EYES: flush with water for at least 15 minutes.  
 3.4 TLV-TWA: 100 ppm  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 1;  $\text{LD}_{50}$  = 5-15 g/kg (rat-single oral dose)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 IDLH Value: 2,000 ppm  
 3.14 OSHA PEL-TWA: 150 ppm  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 75°F C.C.  
 4.2 Flammable Limits in Air: 1.7%-9.0%  
 4.3 Fire Extinguishing Agents: Carbon dioxide, dry chemicals  
 4.4 Fire Extinguishing Agents Not to Be Used: Water maybe ineffective on fire.  
 4.5 Special Hazards of Combustion Products: Not pertinent  
 4.6 Behavior in Fire: Not pertinent  
 4.7 Auto Ignition Temperature: 763°F  
 4.8 Electrical Hazards: Class I, Group D  
 4.9 Burning Rate: 3.1 mm/min.  
 4.10 Adiabatic Flame Temperature: Currently not available  
 4.11 Stoichiometric Air to Fuel Ratio: 28.6 (calc.)  
 4.12 Flame Temperature: Currently not available  
 4.13 Combustion Molar Ratio (Reactant to Product): 9.0 (calc.)  
 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
 5.2 Reactivity with Common Materials: No reaction  
 5.3 Stability During Transport: Stable  
 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
 5.5 Polymerization: Not pertinent  
 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
 6.2 Waterfowl Toxicity: Currently not available  
 6.3 Biological Oxygen Demand (BOD): Currently not available  
 6.4 Food Chain Concentration Potential: None  
 6.5 GESAMP Hazard Profile:  
 Bioaccumulation: 0  
 Damage to living resources: 0  
 Human Oral hazard: 0  
 Human Contact hazard: 0  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99+%  
 7.2 Storage Temperature: Ambient  
 7.3 Inert Atmosphere: No requirement  
 7.4 Venting: Open (flame arrester) or pressure-vacuum  
 7.5 IMO Pollution Category: D  
 7.6 Ship Type: Data not available  
 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
 8.2 49 CFR Class: 3  
 8.3 49 CFR Package Group: II  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
 9.2 Molecular Weight: 74.12  
 9.3 Boiling Point at 1 atm: 211°F = 99.5°C = 372.7°K  
 9.4 Freezing Point: -174.5°F = -114.7°C = 158.5°K  
 9.5 Critical Temperature: 505.0°F = 262.8°C = 536°K  
 9.6 Critical Pressure: 608.4 psia = 41.39 atm = 4.193 MN/m<sup>2</sup>  
 9.7 Specific Gravity: 0.807 at 20°C (liquid)  
 9.8 Liquid Surface Tension: 23.0 dynes/cm = .023 N/m at 20°C  
 9.9 Liquid Water Interfacial Tension: Currently not available  
 9.10 Vapor (Gas) Specific Gravity: Not pertinent  
 9.11 Ratio of Specific Heats of Vapor (Gas): 1.080  
 9.12 Latent Heat of Vaporization: 243 Btu/lb = 135 cal/g = 5.65 X 10<sup>5</sup> J/kg  
 9.13 Heat of Combustion: -15,500 Btu/lb = -8600 cal/g = -360 X 10<sup>6</sup> J/kg  
 9.14 Heat of Decomposition: Not pertinent  
 9.15 Heat of Solution: Currently not available  
 9.16 Heat of Polymerization: Not pertinent  
 9.17 Heat of Fusion: Currently not available  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: 0.2 psia

### NOTES



# SEC-BUTYL ALCOHOL

BAS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	51.580	0	0.522	45	0.961	35	5.892
40	51.410	5	0.526	50	0.957	40	5.448
45	51.240	10	0.530	55	0.954	45	5.045
50	51.060	15	0.534	60	0.950	50	4.680
55	50.890	20	0.538	65	0.946	55	4.347
60	50.720	25	0.541	70	0.942	60	4.044
65	50.540	30	0.545	75	0.938	65	3.767
70	50.370	35	0.549	80	0.934	70	3.513
75	50.190	40	0.553	85	0.930	75	3.281
80	50.020	45	0.557	90	0.926	80	3.068
85	49.850	50	0.561	95	0.922	85	2.873
90	49.670	55	0.565	100	0.918	90	2.693
95	49.500	60	0.569	105	0.914	95	2.528
100	49.330	65	0.573	110	0.911	100	2.375
105	49.150	70	0.576	115	0.907	105	2.234
110	48.980	75	0.580	120	0.903	110	2.103
115	48.810	80	0.584	125	0.899	115	1.983
120	48.630	85	0.588	130	0.895	120	1.871
		90	0.592			125	1.767
		95	0.596			130	1.670
		100	0.600			135	1.581
						140	1.497
						145	1.419
						150	1.347
						155	1.279
						160	1.216

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	20.000	40	0.072	40	0.00099	0	0.327
		50	0.112	50	0.00151	20	0.337
		60	0.171	60	0.00227	40	0.348
		70	0.255	70	0.00332	60	0.358
		80	0.373	80	0.00478	80	0.368
		90	0.536	90	0.00674	100	0.377
		100	0.757	100	0.00934	120	0.387
		110	1.052	110	0.01276	140	0.396
		120	1.440	120	0.01716	160	0.405
		130	1.944	130	0.02276	180	0.415
		140	2.589	140	0.02981	200	0.423
		150	3.407	150	0.03858	220	0.432
		160	4.431	160	0.04937	240	0.441
		170	5.701	170	0.06252	260	0.449
		180	7.262	180	0.07839	280	0.457
		190	9.162	190	0.09738	300	0.465
		200	11.460	200	0.11990	320	0.473
		210	14.200	210	0.14640	340	0.481
						360	0.488
						380	0.495
						400	0.503
						420	0.510
						440	0.516

# TERT-BUTYL ALCOHOL

BAT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Methyl-2-propanol Trimethylcarbinol	Oily liquid  Colorless  Sharp alcohol odor  Floats and mixes with water. Flammable, irritating vapor is produced. Freezing point is 78°F.
<b>Restrict access.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, carbon dioxide, or alcohol foam. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose, throat. If inhaled, will cause dizziness, difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 20; Alcohols, glycols  
2.2 **Formula:** (CH<sub>3</sub>)<sub>3</sub>COH  
2.3 **IMO/UN Designation:** 3.3/1122  
2.4 **DOT ID No.:** 1120  
2.5 **CAS Registry No.:** 75-65-0  
2.6 **NAERG Guide No.:** 129  
2.7 **Standard Industrial Trade Classification:** 51213

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air pack or organic canister mask, rubber gloves, and goggles  
3.2 **Symptoms Following Exposure:** Vapor is narcotic in action and irritating to respiratory passages. Liquid is irritating to skin and eyes.  
3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure and restore breathing. SKIN, EYE CONTACT: remove liquid from skin with water. Flush eyes with water.  
3.4 **TLV-TWA:** 100 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5.0 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 1,600 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 61°F O.C. 52°F C.C.  
4.2 **Flammable Limits in Air:** 2.35%-8.00%  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective on fire  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 896°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 3.4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 74.12  
9.3 **Boiling Point at 1 atm:** 181°F = 82.6°C = 355.8°K  
9.4 **Freezing Point:** 78.3°F = 25.7°C = 298.9°K  
9.5 **Critical Temperature:** 451.4°F = 233°C = 506.2°K  
9.6 **Critical Pressure:** 576 psia = 39.2 atm = 3.97 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.78 at 26°C (liquid)  
9.8 **Liquid Surface Tension:** 20.7 dynes/cm = 0.0207 N/m at 25°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.6  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.080  
9.12 **Latent Heat of Vaporization:** 234 Btu/lb = 130 cal/g = 5.44 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -14,000 Btu/lb = -7780 cal/g = -325.7 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 21.88 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 1.8 psia

### NOTES

# TERT-BUTYL ALCOHOL

BAT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
80	48.560	80	0.725	82	0.746	80	3.774
82	48.500	85	0.733	84	0.745	85	3.353
84	48.430	90	0.742	86	0.744	90	2.985
86	48.370	95	0.750	88	0.743	95	2.664
88	48.300	100	0.758	90	0.742	100	2.382
90	48.230	105	0.767	92	0.741	105	2.134
92	48.170	110	0.775	94	0.740	110	1.915
94	48.100	115	0.783	96	0.739	115	1.722
96	48.040	120	0.792	98	0.738	120	1.552
98	47.970	125	0.800	100	0.737	125	1.401
100	47.910	130	0.808	102	0.736	130	1.266
102	47.840	135	0.817	104	0.735	135	1.147
104	47.780	140	0.825	106	0.734	140	1.040
106	47.710	145	0.833	108	0.733	145	0.945
108	47.650	150	0.842	110	0.732	150	0.860
110	47.580	155	0.850	112	0.731	155	0.784
112	47.520	160	0.858	114	0.730	160	0.716
114	47.450	165	0.867	116	0.729	165	0.654
116	47.390	170	0.875	118	0.728	170	0.599
118	47.320	175	0.883	120	0.727	175	0.549
120	47.260			122	0.726		
122	47.190			124	0.725		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	80	0.908	80	0.01161	0	0.322
	I	85	1.072	85	0.01359	20	0.334
	S	90	1.262	90	0.01585	40	0.346
	C	95	1.481	95	0.01844	60	0.357
	I	100	1.734	100	0.02140	80	0.368
	B	105	2.024	105	0.02475	100	0.379
	L	110	2.357	110	0.02857	120	0.390
	E	115	2.736	115	0.03288	140	0.401
		120	3.169	120	0.03775	160	0.411
		125	3.661	125	0.04323	180	0.422
		130	4.219	130	0.04940	200	0.432
		135	4.850	135	0.05631	220	0.442
		140	5.563	140	0.06405	240	0.452
		145	6.366	145	0.07269	260	0.461
		150	7.268	150	0.08232	280	0.471
		155	8.281	155	0.09303	300	0.480
						320	0.490
						340	0.499
						360	0.508
						380	0.517
						400	0.525
						420	0.534
						440	0.542

# BENZYL BROMIDE

BBR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bromotoluene, alpha alpha-Bromotoluene omega-Bromotoluene	Liquid  Colorless to yellow  Sharp irritating odor  Sinks in water.
Restrict access. Avoid contact with liquid and vapor. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Irritating gases are produced when heated. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Chemical and Physical Treatment:  
Neutralize  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_6H_5CH_2Br$   
2.3 IMO/UN Designation: 8/1737  
2.4 DOT ID No.: 1737  
2.5 CAS Registry No.: 100-39-0  
2.6 NAERG Guide No.: 156  
2.7 Standard Industrial Trade Classification:  
51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; goggles; rubber gloves; protective clothing.  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat; severe exposure may cause pulmonary edema. Vapors cause severe eye irritation; liquid can burn eyes. Skin contact causes irritation. Ingestion causes irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air. EYES: irrigate with copious amounts of water for 15 min. SKIN: flush with water, wash with soap and water. INGESTION: do NOT induce vomiting; give large amounts of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 188°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating hydrogen bromide gas may be formed.  
4.6 **Behavior in Fire:** Forms vapor that is a powerful tear gas.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 2.6 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly to generate hydrogen bromide (hydrobromic acid).  
5.2 **Reactivity with Common Materials:** Incompatible with bases, oxidizers and alcohols. Decomposes rapidly in the presence of all common metals except nickel and lead, liberating heat and hydrogen bromide.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Polymerizes with evolution of heat and hydrogen bromide when in contact with all common metals except nickel and lead.  
5.6 **Inhibitor of Polymerization:** None used.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.05 mg/l/\*marine fish/no irritant response/salt water  
0.1 mg/l/\*marine fish/violent irritant activity/salt water  
\*Time period not specified  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 171.0  
9.3 **Boiling Point at 1 atm:** 388°F = 198°C = 471°K  
9.4 **Freezing Point:** 25.0°F = -3.9°C = 269.3°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.441 at 22°C (liquid)  
9.8 **Liquid Surface Tension:** 32.3 dynes/cm = 0.0323 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 35 dynes/cm = 0.035 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 5.9  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 120 Btu/lb = 66.4 cal/g =  $2.78 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** (est.) -9,000 Btu/lb = -5,000 cal/g =  $-210 \times 10^6$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 20.86 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BENZYL BROMIDE

BBR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	91.070	51	0.441	51	1.048	51	0.954
36	91.000	52	0.441	52	1.048	52	0.945
38	90.929	53	0.442	53	1.048	53	0.937
40	90.860	54	0.442	54	1.048	54	0.928
42	90.790	55	0.443	55	1.048	55	0.920
44	90.719	56	0.443	56	1.048	56	0.912
46	90.650	57	0.444	57	1.048	57	0.904
48	90.580	58	0.444	58	1.048	58	0.896
50	90.509	59	0.445	59	1.048	59	0.888
52	90.440	60	0.446	60	1.048	60	0.880
54	90.370	61	0.446	61	1.048	61	0.872
56	90.299	62	0.447	62	1.048	62	0.865
58	90.230	63	0.447	63	1.048	63	0.857
60	90.169	64	0.448	64	1.048	64	0.850
62	90.099	65	0.448	65	1.048	65	0.842
64	90.030	66	0.449	66	1.048	66	0.835
66	89.959	67	0.449	67	1.048	67	0.828
68	89.889	68	0.450	68	1.048	68	0.821
70	89.820	69	0.451	69	1.048	69	0.814
72	89.750	70	0.451	70	1.048	70	0.807
74	89.679	71	0.452	71	1.048	71	0.800
76	89.610	72	0.452	72	1.048	72	0.794
		73	0.453	73	1.048	73	0.787
		74	0.453	74	1.048	74	0.780
		75	0.454	75	1.048	75	0.774
		76	0.454	76	1.048	76	0.768

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	160	0.172	160	0.00442		N
	N	170	0.223	170	0.00565		O
	S	180	0.288	180	0.00716		T
	O	190	0.368	190	0.00902		
	L	200	0.467	200	0.01127		P
	U	210	0.588	210	0.01399		E
	B	220	0.736	220	0.01724		R
	L	230	0.915	230	0.02113		T
	E	240	1.130	240	0.02573		I
		250	1.388	250	0.03115		N
		260	1.695	260	0.03751		E
		270	2.058	270	0.04493		N
		280	2.487	280	0.05355		T
		290	2.989	290	0.06351		
		300	3.575	300	0.07497		
		310	4.257	310	0.08811		
		320	5.046	320	0.10310		
		330	5.955	330	0.12010		
		340	7.000	340	0.13940		
		350	8.195	350	0.16120		
		360	9.556	360	0.18570		
		370	11.100	370	0.21320		
		380	12.850	380	0.24390		
		390	14.830	390	0.27800		

# 2-BROMOBUTANE

BBT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> sec-Butyl bromide Methyl ethyl bromo-methane	Liquid  Colorless  Sinks in water
Avoid contact with liquid and vapor. Keep people away. Wear self-contained breathing apparatus and full protective clothing. Shut off sources of ignition. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	EXTREMELY FLAMMABLE. Containers may explode in fire. Flashback may occur along vapor trail. Forms explosive mixtures when mixed with air. Water may be ineffective against fire. Wear self-contained breathing apparatus and full protective clothing. Extinguish with CO <sub>2</sub> , dry chemical, or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Harmful if inhaled or absorbed through the skin. Irritating to the eyes, nose, throat, and upper respiratory tract. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID May be harmful if swallowed or absorbed through the skin. Irritating to the eyes and skin. Remove contaminated clothing and shoes. IF IN EYES: immediately flush with running water for at least 15 minutes. IF SWALLOWED and victim is CONSCIOUS: have victim drink water and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: CH <sub>3</sub> CHBrCH <sub>2</sub> CH <sub>3</sub> 2.3 IMO/UN Designation: 3.2/2339 2.4 DOT ID No.: 2339 2.5 CAS Registry No.: 78-76-2 2.6 NAERG Guide No.: 130 2.7 Standard Industrial Trade Classification: 51139
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Approved respirator, chemical-resistant gloves, safety goggles, other protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Irritating to eyes, nose, throat, upper respiratory tract, and skin. Symptoms of exposure include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. 3.3 <b>Treatment of Exposure:</b> Call a physician. EYES: Flush with running water for at least 15 minutes. SKIN: remove contaminated clothing and shoes. Flush affected areas with plenty of running water. Wash with soap and water. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: If victim is conscious, have victim drink water and have victim induce vomiting. If victim is unconscious, do nothing except keep victim warm. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 2; TD <sub>01</sub> = 3.0 g/kg (ipr, mouse) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Suspected carcinogen. 3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 70°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Foam, CO<sub>2</sub>, dry chemical.  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective against fire.  
4.5 Special Hazards of Combustion Products: Toxic fumes of Br  
4.6 Behavior in Fire: May form explosive mixtures with air in a fire.  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 28.6 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 12.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 98%  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: None  
7.4 Venting: None  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 137.04  
9.3 Boiling Point at 1 atm: 196.5°F = 91.4°C = 365°K  
9.4 Freezing Point: -169.4°F = -111.9°C = 161.3°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 1.258 at 20°C  
9.8 Liquid Surface Tension: 25.3 dyne/cm = 0.025 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 4.7  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: 21.62  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# 2-BROMOBUTANE

BBT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	78.570		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.177 0.183 0.189 0.195 0.201 0.206 0.212 0.218 0.224 0.230 0.236 0.242 0.248 0.254 0.260 0.266 0.272 0.278 0.284 0.290 0.296 0.302 0.308 0.314 0.320

# 1-BROMOBUTANE

BBU

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Bromobutane Butyl bromide n-Butyl bromide		Liquid  Colorless to pale yellow  Sinks in water.
Avoid contact with liquid or vapor. Keep people away. Wear self-contained breathing apparatus and full protective clothing. Shut off all sources of ignition. Call fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	<b>FLAMMABLE</b> Water may be ineffective against fire. Flashback along vapor trail may occur. Wear self-contained breathing apparatus and full protective clothing. Extinguish with dry chemical, CO <sub>2</sub> , or foam.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  <b>VAPOR</b> May be harmful if inhaled or absorbed through skin. Irritating to the eyes, upper respiratory tract, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to eyes and skin. May be harmful if swallowed or absorbed through the skin. Remove contaminated clothing and shoes. Flush affected areas with water. Wash with soap and water. IF IN EYES: immediately flush with water for at least 15 minutes. IF SWALLOWED and victim is CONSCIOUS: have victim drink water and induce vomiting IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.	
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> Br 2.3 IMO/UN Designation: 3.3/1126 2.4 DOT ID No.: 1126 2.5 CAS Registry No.: 109-65-9 2.6 NAERG Guide No.: 129 2.7 Standard Industrial Trade Classification: 51139
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Approved respirator, chemical safety goggles, rubber gloves. 3.2 <b>Symptoms Following Exposure:</b> Irritating to the eyes, nose, throat, and upper respiratory tract. Symptoms of exposure include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Irritating to the skin. 3.3 <b>Treatment of Exposure:</b> INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with water for at least 15 minutes. INGESTION: If conscious, have victim drink water and induce vomiting. If unconscious, do nothing except keep victim warm. Call a physician. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 2; LD <sub>50</sub> = 4.45 g/kg (rat, ipr) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 65°F C.C.  
4.2 Flammable Limits in Air: 2.5-6.6% at 100°C  
4.3 Fire Extinguishing Agents: CO<sub>2</sub>, dry chemical, or foam.  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective against fire.  
4.5 Special Hazards of Combustion Products: Toxic fumes of hydrogen bromide.  
4.6 Behavior in Fire: May form explosive mixtures with air in fire.  
4.7 Auto Ignition Temperature: 509°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 28.6 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 12.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Incompatible with strong bases and oxidizers.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: (1)  
Human Contact hazard: -  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: None  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  
Category Classification  
Health Hazard (Blue)..... 2  
Flammability (Red)..... 3  
Instability (Yellow)..... 0  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 137.04  
9.3 Boiling Point at 1 atm: 214°F = 101.4°C = 375°K  
9.4 Freezing Point: -170°F = -112.4°C = 161°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 1.276 at 20°C  
9.8 Liquid Surface Tension: 26.5 dyne/cm = 0.026 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 4.72  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 1.5 psia

## NOTES



# 1-BROMOBUTANE

BBU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	79.650		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	59 60 61 62 63 64 65 66 67 68	0.626 0.627 0.628 0.629 0.629 0.630 0.631 0.632 0.632 0.633

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
60	0.060	-40 -20 0 20 40 60 80 100 120 140 160 180 200	0.036 0.058 0.095 0.155 0.254 0.415 0.678 1.108 1.811 2.960 4.839 7.909 12.928		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.183 0.189 0.194 0.200 0.205 0.211 0.217 0.222 0.228 0.233 0.239 0.245 0.250 0.256 0.261 0.267 0.273 0.278 0.284 0.289 0.295 0.301 0.306 0.312 0.317

# BROMOBENZENE

BBZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bromobenzol Monobromobenzene Phenyl bromide		Liquid	Colorless	Pleasant odor
		Sinks in water.		
Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.			
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>6</sub>H<sub>5</sub>Br  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2514  
2.5 CAS Registry No.: 108-86-1  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves and apron.  
3.2 **Symptoms Following Exposure:** Contact with liquid causes irritation of eyes and mild irritation of skin. Ingestion causes mild irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: induce vomiting; consult a doctor.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 124°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating hydrogen bromide and other gases may be produced in fire.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 1,049°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 3.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: Z  
Damage to living resources: (2)  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 157  
9.3 **Boiling Point at 1 atm:** 313°F = 156°C = 429°K  
9.4 **Freezing Point:** -23.1°F = -30.6°C = 242.6°K  
9.5 **Critical Temperature:** 746.6°F = 397°C = 670.2°K  
9.6 **Critical Pressure:** 655 psia = 44.6 atm = 4.52 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.49 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** 36 dynes/cm = 0.036 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 5.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0931  
9.12 **Latent Heat of Vaporization:** 104 Btu/lb = 58 cal/g = 2.4 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -8,510 Btu/lb = -4,730 cal/g = -198 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 16.17 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BROMOBENZENE

BBZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	94.490	40	0.231	0	0.827	50	1.347
50	94.009	50	0.233	10	0.819	60	1.242
60	93.520	60	0.235	20	0.811	70	1.148
70	93.040	70	0.236	30	0.804	80	1.064
80	92.549	80	0.238	40	0.796	90	0.990
90	92.070	90	0.240	50	0.788	100	0.923
100	91.580	100	0.241	60	0.781	110	0.862
110	91.089	110	0.243	70	0.773	120	0.807
120	90.610	120	0.245	80	0.766	130	0.758
130	90.120	130	0.246	90	0.758	140	0.713
140	89.639	140	0.248	100	0.750	150	0.672
150	89.150	150	0.250	110	0.743	160	0.635
160	88.669	160	0.251	120	0.735	170	0.601
170	88.179	170	0.253	130	0.727	180	0.569
180	87.700	180	0.255	140	0.720	190	0.540
190	87.209	190	0.256	150	0.712	200	0.514
200	86.730	200	0.258	160	0.705	210	0.489
210	86.240	210	0.260	170	0.697		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.031	60	0.049	60	0.00137	0	0.133
36	0.031	70	0.068	70	0.00186	25	0.139
38	0.032	80	0.093	80	0.00251	50	0.144
40	0.033	90	0.126	90	0.00335	75	0.150
42	0.034	100	0.169	100	0.00442	100	0.156
44	0.034	110	0.225	110	0.00577	125	0.162
46	0.035	120	0.296	120	0.00746	150	0.167
48	0.036	130	0.386	130	0.00957	175	0.173
50	0.037	140	0.498	140	0.01216	200	0.179
52	0.037	150	0.639	150	0.01533	225	0.185
54	0.038	160	0.812	160	0.01917	250	0.191
56	0.039	170	1.025	170	0.02380	275	0.196
58	0.040	180	1.283	180	0.02934	300	0.202
60	0.040	190	1.596	190	0.03594	325	0.208
62	0.041	200	1.972	200	0.04373	350	0.214
64	0.042	210	2.422	210	0.05289	375	0.219
66	0.043	220	2.956	220	0.06360	400	0.225
68	0.043	230	3.586	230	0.07606	425	0.231
70	0.044	240	4.328	240	0.09047	450	0.237
72	0.045	250	5.195	250	0.10710	475	0.243
74	0.046	260	6.204	260	0.12610	500	0.248
76	0.046	270	7.373	270	0.14780	525	0.254
78	0.047	280	8.722	280	0.17250	550	0.260
80	0.048	290	10.270	290	0.20040	575	0.266
82	0.049	300	12.040	300	0.23190	600	0.271
84	0.049	310	14.060	310	0.26730		

# BENZYL CHLOROFORMATE

BCF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzylcarbonyl chloride Benzyl chloroformate Carbobenzoxy chloride Chloroformic acid, benzyl ester	Liquid  Colorless  Sharp, irritating odor  Sinks in water. Reacts with water.
<b>Restrict access.</b> <b>Call fire department.</b> <b>Avoid contact with liquid.</b> <b>Stop discharge if possible.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Wear chemical protective suit with self-contained breathing apparatus. Extinguish with dry chemicals, foam or carbon dioxide.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Chemical and Physical Treatment:  
Neutralize  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_6H_5CH_2OCOCI$   
2.3 IMO/UN Designation: 8/1739  
2.4 DOT ID No.: 1739  
2.5 CAS Registry No.: 501-53-1  
2.6 NAERG Guide No.: 137  
2.7 Standard Industrial Trade Classification: 51374

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus or acid-type canister mask; goggles or face shield; rubber gloves; protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes mucous membrane irritation. Eyes are irritated by excessive exposure to vapor. Liquid causes severe irritation of eyes and irritates skin. Ingestion causes irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; support respiration; call physician. EYES: irrigate with copious amounts of water for 15 min. SKIN: flush with large quantities of water; wash with soap and water. INGESTION: give large amounts of water; do NOT induce vomiting.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3;  $LD_{50}$  = 50 to 500 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 176°F O.C. 227°F C.C.  
Vigorous decomposition occurs at these temperatures; thus these values are anomalous due to the effect of the decomp. products (benzyl chloride and  $CO_2$ ).
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Dry chemical, foam and carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Toxic phosgene, hydrogen chloride, and benzyl chloride vapors may form.
- 4.6 **Behavior in Fire:** Containers may explode.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 4.0 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Forms hydrogen chloride (hydrochloric acid). The reaction is not very vigorous in cold water.
- 5.2 **Reactivity with Common Materials:** Slow corrosion of metal.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Exothermic.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: -  
Human Contact hazard: I  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97+%
- 7.2 **Storage Temperature:** Ambient, in cool place
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material
- 8.2 49 CFR Class: 8
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: Yes
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 170.6
- 9.3 Boiling Point at 1 atm: (decomposes) 306°F = 152°C = 425°K
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.22 at 20°C (liquid)
- 9.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: > 1
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: (est.) 90 Btu/lb = 50 cal/g =  $2.1 \times 10^5$  J/kg
- 9.13 Heat of Combustion: (est.) -10,000 Btu/lb = -5,700 cal/g =  $-240 \times 10^5$  J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# BENZYL CHLOROFORMATE

BCF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
51	76.740	51	0.450	51	1.048	52	3.103
52	76.709	52	0.450	52	1.048	54	3.027
53	76.679	53	0.450	53	1.048	56	2.954
54	76.639	54	0.450	54	1.048	58	2.883
55	76.610	55	0.450	55	1.048	60	2.814
56	76.570	56	0.450	56	1.048	62	2.748
57	76.540	57	0.450	57	1.048	64	2.683
58	76.500	58	0.450	58	1.048	66	2.621
59	76.469	59	0.450	59	1.048	68	2.561
60	76.429	60	0.450	60	1.048	70	2.502
61	76.400	61	0.450	61	1.048	72	2.445
62	76.360	62	0.450	62	1.048	74	2.390
63	76.330	63	0.450	63	1.048	76	2.336
64	76.290	64	0.450	64	1.048	78	2.284
65	76.259	65	0.450	65	1.048	80	2.234
66	76.219	66	0.450	66	1.048	82	2.185
67	76.190	67	0.450	67	1.048	84	2.137
68	76.150	68	0.450	68	1.048	86	2.091
69	76.120	69	0.450				
70	76.089	70	0.450				
71	76.049	71	0.450				
72	76.020	72	0.450				
73	75.980	73	0.450				
74	75.950	74	0.450				
75	75.910	75	0.450				
76	75.879	76	0.450				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	215	0.347	215	0.00818	0	0.176
	E	220	0.438	220	0.01025	10	0.176
	A	225	0.551	225	0.01280	20	0.176
	C	230	0.691	230	0.01593	30	0.176
	T	235	0.864	235	0.01977	40	0.176
	S	240	1.076	240	0.02445	50	0.176
		245	1.337	245	0.03015	60	0.176
		250	1.655	250	0.03706	70	0.176
		255	2.043	255	0.04543	80	0.176
		260	2.515	260	0.05553	90	0.176
		265	3.086	265	0.06768	100	0.176
		270	3.777	270	0.08226	110	0.176
		275	4.609	275	0.09971	120	0.176
		280	5.611	280	0.12050	130	0.176
		285	6.811	285	0.14540	140	0.176
		290	8.247	290	0.17480	150	0.176
		295	9.961	295	0.20980	160	0.176
		300	12.000	300	0.25110	170	0.176

# BENZYL CHLORIDE

**BCL**

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> alpha-Chlorotoluene omega-Chlorotoluene	Watery liquid	Colorless to yellow	Sharp irritating odor
Sinks in water.			
<b>Restrict access.</b> <b>Avoid contact with liquid.</b> <b>Stop discharge if possible.</b> <b>Call fire department.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Combustible. Irritating gases are produced when heated. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.		
<b>Exposure</b>	Call for medical aid.  LIQUID Will burn skin and eyes. If swallowed will cause nausea, and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Chemical and Physical Treatment:  
Neutralize  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 36; Halogenated hydrocarbons  
2.2 **Formula:** C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>Cl  
2.3 **IMO/UN Designation:** 8/1738  
2.4 **DOT ID No.:** 1738  
2.5 **CAS Registry No.:** 100-44-7  
2.6 **NAERG Guide No.:** 156  
2.7 **Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles or face shield; self-contained breathing apparatus, positive-pressure hose mask, air-line mask, industrial canister-type gas mask, or chemical cartridge respirator; rubber gloves; protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory tract with coughing, burning of the throat, headache, dizziness, and weakness; lung damage and pulmonary edema may occur after severe exposure; chronic irritation of the upper respiratory tract may occur after prolonged and repeated exposure to vapors. Immediate and severe eye irritation may result from contact with the liquid or vapors; prolonged or permanent eye damage may result. Vapors irritate skin, and liquid may cause severe burns. Ingestion may cause immediate and severe burns of the mouth, throat, and gastrointestinal tract; nausea, vomiting, cramps, and diarrhea may follow; gastrointestinal damage and systemic effects may result.
- 3.3 **Treatment of Exposure:** INHALATION: remove from contaminated atmosphere; if breathing has ceased, start mouth-to-mouth resuscitation; oxygen, if available, should be administered only by an experienced person when authorized by a physician; keep patient warm and comfortable; call a physician immediately. EYES: immediately flush with large quantities of running water for a minimum of 15 min.; hold eyelids apart during irrigation to insure flushing of the entire surface of the eye and lids with water; do not attempt to neutralize with chemical agents; obtain medical attention as soon as possible; oils or ointments should not be used unless directed by a physician; continue irrigation for an additional 15 min. if physician is not available. SKIN: immediately flush affected areas with water; remove contaminated clothing under shower; continue washing with water; do not attempt to neutralize with chemical agents; obtain medical attention if irritation persists. INGESTION: give large amounts of water; do NOT induce vomiting.
- 3.4 **TLV-TWA:** 1 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 1,231 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** 0.047 ppm  
3.13 **IDLH Value:** 10 ppm  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 165°F O.C. 140°F C.C.  
4.2 **Flammable Limits in Air:** 1.1% (LFL)  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, and carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride gas may form.  
4.6 **Behavior in Fire:** Forms vapor that is a powerful tear gas.  
4.7 **Auto Ignition Temperature:** 1,161°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 4.2 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Undergoes slow hydrolysis, liberating hydrogen chloride (hydrochloric acid).  
5.2 **Reactivity with Common Materials:** Decomposes rapidly in the presence of all common metals (with the exception of nickel and lead), liberating heat and hydrogen chloride.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Polymerizes with evolution of heat and hydrogen chloride when in contact with all common metals except nickel and lead.  
5.6 **Inhibitor of Polymerization:** Triethylamine, propylene oxide, or sodium carbonate.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.05 mg/l/"marine fish/no irritant response/salt water  
0.1 mg/l/"marine fish/violent irritant activity/salt water  
\*Time period not specified.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98.5+%, either anhydrous or stabilized  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** P028  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 126.6  
9.3 **Boiling Point at 1 atm:** 354.9°F = 179.4°C = 452.6°K  
9.4 **Freezing Point:** -38.6°F = -39.2°C = 234.0°K  
9.5 **Critical Temperature:** (est.) 772°F = 411°C = 684°K  
9.6 **Critical Pressure:** (est.) 567 psia = 38.5 atm = 3.91 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.10 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** 37.5 dynes/cm = 0.0375 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 4.36  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0689  
9.12 **Latent Heat of Vaporization:** 130 Btu/lb = 70 cal/g = 2.9 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -12,000 Btu/lb = -6,700 cal/g = -280 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.07 psia

### NOTES

# BENZYL CHLORIDE

BCL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	70.200	40	0.321	40	0.910	55	1.544
50	69.790	50	0.323	50	0.908	60	1.477
60	69.370	60	0.325	60	0.906	65	1.413
70	68.959	70	0.327	70	0.904	70	1.354
80	68.540	80	0.329	80	0.902	75	1.298
90	68.120	90	0.331	90	0.901	80	1.245
100	67.709	100	0.332	100	0.899	85	1.195
110	67.290	110	0.334	110	0.897	90	1.148
120	66.870	120	0.336	120	0.895	95	1.104
130	66.459	130	0.338	130	0.893	100	1.062
140	66.040	140	0.340	140	0.892	105	1.023
150	65.629	150	0.342	150	0.890	110	0.985
160	65.209	160	0.343	160	0.888	115	0.950
170	64.790	170	0.345	170	0.886	120	0.917
180	64.379	180	0.347	180	0.884	125	0.885
190	63.960	190	0.349	190	0.883	130	0.855
200	63.550	200	0.351	200	0.881	135	0.826
210	63.130	210	0.353	210	0.879	140	0.799
						145	0.773
						150	0.748
						155	0.724
						160	0.702
						165	0.681
						170	0.660
						175	0.641

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.003	70	0.021	70	0.00047	0	0.218
		80	0.030	80	0.00066	25	0.227
		90	0.042	90	0.00089	50	0.237
		100	0.057	100	0.00121	75	0.246
		110	0.078	110	0.00161	100	0.255
		120	0.105	120	0.00213	125	0.264
		130	0.140	130	0.00279	150	0.274
		140	0.184	140	0.00362	175	0.283
		150	0.241	150	0.00466	200	0.292
		160	0.312	160	0.00594	225	0.301
		170	0.401	170	0.00751	250	0.311
		180	0.511	180	0.00942	275	0.320
		190	0.647	190	0.01174	300	0.329
		200	0.813	200	0.01453	325	0.338
		210	1.014	210	0.01787	350	0.348
		220	1.258	220	0.02183	375	0.357
		230	1.550	230	0.02651	400	0.366
		240	1.899	240	0.03200	425	0.375
		250	2.312	250	0.03843	450	0.385
		260	2.801	260	0.04590	475	0.394
		270	3.375	270	0.05455	500	0.403
		280	4.046	280	0.06451	525	0.412
		290	4.827	290	0.07594	550	0.422
		300	5.733	300	0.08900	575	0.431
		310	6.777	310	0.10380	600	0.440
		320	7.978	320	0.12070		

# N-BUTYL ACETATE

BCN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, n-butyl ester Butyl acetate Butyl ethanoate			
Watery liquid	Colorless	Pleasant fruity odor	
Floats on water. Flammable irritating vapor is produced.			
Restrict access. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, dizziness, headache or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $\text{CH}_3\text{COO}(\text{CH}_2)_3\text{CH}_3$   
2.3 IMO/UN Designation: 3.2/1123  
2.4 DOT ID No.: 1123  
2.5 CAS Registry No.: 123-86-4  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** All-purpose canister mask, chemical safety goggles, rubber gloves.  
3.2 **Symptoms Following Exposure:** SKIN: prolonged or frequently repeated exposures may lead to drying. INHALATION: headaches, dizziness, nausea, irritation of respiratory passages and eyes.  
3.3 **Treatment of Exposure:** EYES: in case of contact, flush with water for at least 15 min. INHALATION: remove from exposure immediately. Call a physician. If breathing is irregular or stopped, start resuscitation, administer oxygen. INGESTION: induce vomiting and call a physician.  
3.4 **TLV-TWA:** 150 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 200 ppm.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 10 ppm  
3.13 **IDLH Value:** 1,700 ppm  
3.14 **OSHA PEL-TWA:** 150 ppm.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 81°F C.C.  
4.2 **Flammable Limits in Air:** 1.7%-7.6%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water in straight hose stream will scatter and spread fire and should not be used.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 760°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 4.4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
44 ppm/48 hr/daphnia/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0.15 to 0.5 lb/lb, 5 days (theor.) 52%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Urethane: 99.5%; pure: 98%; commercial: 90-92%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 116.16  
9.3 **Boiling Point at 1 atm:** 259°F = 126°C = 399°K  
9.4 **Freezing Point:** -100°F = -73.5°C = 199.7°K  
9.5 **Critical Temperature:** 582.6°F = 305.9°C = 579.1°K  
9.6 **Critical Pressure:** 455 psia = 31 atm = 3.1 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.875 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 14.5 dynes/cm = 0.0145 N/m at 25°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 57 dynes/cm = 0.057 N/m at 22°C  
9.10 **Vapor (Gas) Specific Gravity:** 4.00  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.058  
9.12 **Latent Heat of Vaporization:** 133 Btu/lb = 73.9 cal/g = 3.09 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -13,130 Btu/lb = -7294 cal/g = -305.4 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.5 psia

### NOTES



# N-BUTYL ACETATE

BCN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	55.760	35	0.449	30	0.979	55	0.784
40	55.590	40	0.450	40	0.971	60	0.761
45	55.420	45	0.452	50	0.963	65	0.740
50	55.240	50	0.453	60	0.955	70	0.719
55	55.070	55	0.455	70	0.947	75	0.700
60	54.900	60	0.456	80	0.940	80	0.681
65	54.720	65	0.458	90	0.932	85	0.663
70	54.550	70	0.460	100	0.924	90	0.646
75	54.380	75	0.461	110	0.916	95	0.630
80	54.200	80	0.463	120	0.908	100	0.614
85	54.030	85	0.464	130	0.900	105	0.599
90	53.860	90	0.466	140	0.892	110	0.584
95	53.680	95	0.467	150	0.884	115	0.571
100	53.510	100	0.469	160	0.876	120	0.557
105	53.340	105	0.470	170	0.868	125	0.545
110	53.160	110	0.472	180	0.861	130	0.532
115	52.990	115	0.473	190	0.853	135	0.521
120	52.820	120	0.475	200	0.845	140	0.509
		125	0.476				
		130	0.478				
		135	0.479				
		140	0.481				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.000	35	0.065	35	0.00143	0	0.282
		40	0.078	40	0.00168	25	0.294
		45	0.092	45	0.00197	50	0.305
		50	0.109	50	0.00231	75	0.316
		55	0.128	55	0.00269	100	0.327
		60	0.150	60	0.00313	125	0.338
		65	0.176	65	0.00363	150	0.349
		70	0.205	70	0.00420	175	0.360
		75	0.239	75	0.00484	200	0.370
		80	0.277	80	0.00556	225	0.380
		85	0.321	85	0.00638	250	0.390
		90	0.370	90	0.00729	275	0.400
		95	0.426	95	0.00832	300	0.410
		100	0.489	100	0.00946	325	0.420
		105	0.561	105	0.01074	350	0.429
		110	0.640	110	0.01217	375	0.439
		115	0.730	115	0.01375	400	0.448
		120	0.830	120	0.01550	425	0.457
						450	0.466
						475	0.475
						500	0.483
						525	0.492
						550	0.500
						575	0.509
						600	0.517

# BOILER COMPOUND, LIQUID

BCP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Alkaway liquid alkaline deruster	Liquid	Colorless to brown	Odorless or mild odor
	Sinks and mixes with water.		
Restrict access. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. Flammable gas may be produced on contact with metals. Cool exposed containers with water.		
<b>Exposure</b>	Call for medical aid.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: Not pertinent
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 59890

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves; protective clothing.
- 3.2 **Symptoms Following Exposure:** Contact of liquid with eyes causes severe caustic burns. Also causes caustic burns of skin if not washed off immediately. Ingestion causes caustic burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** Basic treatment is identical with that for caustic soda or caustic potash solutions. EYES: flush with water for at least 15 min.; call a doctor. SKIN: flush with water; wash with soap and water. INGESTION: give large amounts of water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Not pertinent
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** May burst container
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Attacks aluminum and zinc; the reaction may form flammable hydrogen gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Various commercial grades, some of which contain chelating and complexing agents for metals.
- 7.2 **Storage Temperature:** Ambient, preferably 40-100°F
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** >220°F = >104°C = >377°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.48 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BOILER COMPOUND, LIQUID

BCP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	92.379	51	0.779	51	4.031		N O T  P E R T I N E N T
54	92.379	52	0.779	52	4.031		
56	92.379	53	0.779	53	4.031		
58	92.379	54	0.779	54	4.031		
60	92.379	55	0.779	55	4.031		
62	92.379	56	0.779	56	4.031		
64	92.379	57	0.779	57	4.031		
66	92.379	58	0.779	58	4.031		
68	92.379	59	0.779	59	4.031		
70	92.379	60	0.779	60	4.031		
72	92.379	61	0.779	61	4.031		
74	92.379	62	0.779	62	4.031		
76	92.379	63	0.779	63	4.031		
78	92.379	64	0.779	64	4.031		
80	92.379	65	0.779	65	4.031		
82	92.379	66	0.779	66	4.031		
84	92.379	67	0.779	67	4.031		P E R T I N E N T
86	92.379	68	0.779	68	4.031		
		69	0.779	69	4.031		
		70	0.779	70	4.031		
		71	0.779	71	4.031		
		72	0.779	72	4.031		
		73	0.779	73	4.031		
		74	0.779	74	4.031		
		75	0.779	75	4.031		
		76	0.779	76	4.031		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BARIUM CHLORATE

BCR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Barium chlorate monohydrate	Solid  White  Odorless   Sinks and mixes with water.
<b>Restrict access.</b> <b>Evacuate.</b> <b>AVOID CONTACT WITH SOLID AND DUST.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Combat fires from safe distance or protected location. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Ba(ClO<sub>3</sub>)<sub>2</sub>·H<sub>2</sub>O  
2.3 IMO/UN Designation: 5.1/1445  
2.4 DOT ID No.: 1445  
2.5 CAS Registry No.: 10294-38-9  
2.6 NAERG Guide No.: 141  
2.7 Standard Industrial Trade Classification: 52339

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; dust respirator (U.S. Bureau of Mines approved); rubberized shoes and gloves; coveralls or other suitable outer clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of upper respiratory system. Contact with eyes or skin causes irritation. Ingestion causes abdominal pain, nausea and vomiting, diarrhea, pallor, blueness shortness of breath, excessive salivation, convulsive tremors, slow, hard pulse, elevated blood pressure, unconsciousness. Hemorrhages may occur in the stomach, intestines, and kidneys. Muscular paralysis may follow.
- 3.3 **Treatment of Exposure:** Get medical attention. Alert doctor to possibility of barium poisoning, particularly if compound was swallowed. **INHALATION:** remove to fresh air. **EYES:** flush with copious quantities of water for at least 15 min.; get medical attention. **SKIN:** flush with water. **INGESTION:** induce vomiting and call a physician; have victim drink aqueous 10% solution of magnesium or sodium sulfate; for severe intoxication, calcium or a magnesium salt may have to be given I.V. with caution; treatment otherwise is supportive and symptomatic.
- 3.4 **TLV-TWA:** 0.5 mg/m<sup>3</sup> as barium  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Barium poisoning  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 50 mg/m<sup>3</sup> as barium  
3.14 **OSHA PEL-TWA:** 0.5 mg/m<sup>3</sup> as barium  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable (but see 7.2)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Yields toxic fumes when involved in fire.
- 4.6 **Behavior in Fire:** May cause an explosion when involved in a fire.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Can form explosive mixtures with combustible materials such as oil and wood; these can be ignited by friction.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; Reagent
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0 1            |
| Flammability (Red).....   | 0 0            |
| Instability (Yellow)..... | 2 2            |
| Special (White).....      | OX OX          |

\* First column refers to non-fire situations.

- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 332 (monohydrate)
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** 777°F = 414°C = 687°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 3.18 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 36 Btu/lb = 20 cal/g = 0.84 X 10<sup>3</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BARIUM CHLORATE

BCR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
32	20.350		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BUTYLTRICHLOROSILANE

BCS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Butyltrichlorosilane	Liquid	Colorless	Sharp, irritating odor
Reacts violently with water. Irritating visible vapor cloud is produced.			
Restrict access. Evacuate. AVOID CONTACT WITH LIQUID AND VAPOR. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE.		
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Chemical and Physical Treatment: Neutralize	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{SiCl}_3$ 2.3 IMO/UN Designation: 8/1747 2.4 DOT ID No.: 1747 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: 155 2.7 Standard Industrial Trade Classification: 51550
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Acid-vapor-type respiratory protection; rubber gloves, chemical worker's goggles, and other protective equipment as necessary to protect skin and eyes. 3.2 <b>Symptoms Following Exposure:</b> Inhalation of vapor irritates upper respiratory system. Contact of liquid with eyes or skin causes severe burns. Ingestion causes burns of mouth and stomach. 3.3 <b>Treatment of Exposure:</b> Seek medical attention after all exposures to this compound. INHALATION: remove to fresh air; apply artificial respiration if required. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; give large amounts of water. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Currently not available. 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 130°F O.C. 126°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water, foam  
4.5 Special Hazards of Combustion Products: Hydrogen chloride, chlorine, or phosgene may be formed.  
4.6 Behavior in Fire: Difficult to extinguish. Re-ignition may occur.  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: 2.2 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 30.9 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 11.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts vigorously to generate hydrogen chloride (hydrochloric acid).  
5.2 Reactivity with Common Materials: Will react with common metals to evolve hydrogen chloride and cause severe corrosion.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with sodium bicarbonate or lime solution.  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: (1)  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 95+%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 191.5  
9.3 Boiling Point at 1 atm: 288°F = 142°C = 415°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.16 at 20°C (liquid)  
9.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 6.5  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: (est.) 81 Btu/lb = 45 cal/g =  $1.9 \times 10^5$  J/kg  
9.13 Heat of Combustion: (est.) -4,300 Btu/lb = -2,400 cal/g =  $-100 \times 10^3$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# BUTYLTRICHLOROSILANE

BCS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	73.570	51	0.300	50	0.783	51	4.064
44	73.490	52	0.300	52	0.783	52	4.005
46	73.410	53	0.300	54	0.783	53	3.948
48	73.330	54	0.300	56	0.783	54	3.892
50	73.250	55	0.300	58	0.783	55	3.836
52	73.169	56	0.300	60	0.783	56	3.782
54	73.080	57	0.300	62	0.783	57	3.729
56	73.000	58	0.300	64	0.783	58	3.677
58	72.919	59	0.300	66	0.783	59	3.625
60	72.839	60	0.300	68	0.783	60	3.575
62	72.759	61	0.300	70	0.783	61	3.525
64	72.679	62	0.300	72	0.783	62	3.476
66	72.599	63	0.300	74	0.783	63	3.428
68	72.520	64	0.300	76	0.783	64	3.381
70	72.440	65	0.300	78	0.783	65	3.335
72	72.360	66	0.300	80	0.783	66	3.290
74	72.280	67	0.300	82	0.783	67	3.245
76	72.200	68	0.300	84	0.783	68	3.201
		69	0.300	86	0.783	69	3.158
		70	0.300	88	0.783	70	3.116
		71	0.300			71	3.074
		72	0.300			72	3.033
		73	0.300			73	2.993
		74	0.300			74	2.954
		75	0.300			75	2.915
		76	0.300			76	2.877

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	70	0.406	70	0.01367		N
	E	80	0.510	80	0.01687		O
	A	90	0.636	90	0.02064		T
	C	100	0.786	100	0.02506		
	T	110	0.965	110	0.03022		P
	S	120	1.176	120	0.03619		E
		130	1.423	130	0.04306		R
		140	1.712	140	0.05093		T
		150	2.047	150	0.05990		I
		160	2.433	160	0.07005		N
		170	2.876	170	0.08149		E
		180	3.383	180	0.09433		N
		190	3.958	190	0.10870		T
		200	4.609	200	0.12470		
		210	5.344	210	0.14230		
		220	6.168	220	0.16190		
		230	7.089	230	0.18340		
		240	8.117	240	0.20700		
		250	9.257	250	0.23270		
		260	10.520	260	0.26080		
		270	11.910	270	0.29120		
		280	13.440	280	0.32420		

# BARIUM CYANIDE

BCY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Barium cyanide solid	Solid crystals      White  Sinks and mixes with water.
Restrict access. AVOID CONTACT WITH SOLID, DUST, AND WATER SOLUTION. Keep people away. Wear chemical protective suit with self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear chemical protective suit with self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. Remove contaminated clothing and shoes. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Collection Systems: Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: Ba(CN) <sub>2</sub> 2.3 IMO/UN Designation: 6.1/1565 2.4 DOT ID No.: 1565 2.5 CAS Registry No.: 542-62-1 2.6 NAERG Guide No.: 157 2.7 Standard Industrial Trade Classification: 52381
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Safety goggles, protective clothing, self-contained breathing apparatus. Equipment should be approved for use around cyanides. 3.2 <b>Symptoms Following Exposure:</b> INHALATION OR INGESTION: Exposure to cyanides can cause headache, vertigo, nausea, and vomiting may occur at low concentrations. High concentration causes difficult breathing, palpitation, paralysis, unconsciousness, respiratory arrest, cyanosis, and death. EYES: Irritation. SKIN: Rash, desquamation and itching. 3.3 <b>Treatment of Exposure:</b> CALL A DOCTOR IMMEDIATELY. INHALATION: Remove from exposure. Break amyl nitrate pearl in cloth and hold lightly under nose for 15 seconds. Repeat 5 times at 15-second intervals. Use artificial respiration if breathing stops. EYES: Wash eyes with copious quantities of water for a minimum of 20 minutes. SKIN: Wash with soap and water. INGESTION: If patient is conscious, induce vomiting and repeat until vomit is clear. Treat as for inhalation. 3.4 TLV-TWA: 0.5 mg/m <sup>3</sup> as Barium (soluble compound). 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 4; LD <sub>50</sub> <50 mg/kg. 3.8 Toxicity by Inhalation: Currently not available. 3.9 <b>Chronic Toxicity:</b> Exposure to small amounts of cyanide compounds over long periods of time is reported to cause loss of appetite, headache, weakness, nausea, dizziness, and irritation of upper respiratory tract and eyes. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 50 mg/m <sup>3</sup> as barium 3.14 <b>OSHA PEL-TWA:</b> 0.5 mg/m <sup>3</sup> as barium 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic cyanides and barium oxides.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Barium will precipitate as sulfate or carbonate. Cyanide will slowly convert to the less toxic cyanate. The cyanide ion is in equilibrium with HCN, a very weak acid.
- 5.2 **Reactivity with Common Materials:** Cyanides in water are corrosive to metals.
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Barium: sodium sulfate or CO<sub>2</sub> will precipitate insoluble salts. Cyanide: ferric salts will precipitate. Lime will suppress HCN evolution and help convert to cyanates.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
96-hour TL<sub>m</sub> for finfish <1 mg/l, highly toxic.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Possible for Barium. Barium has been concentrated 150 times by Goldfish. Half-life in human body - 65 days.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** P013
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 189.40
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** Currently not available
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** -3604 Btu/lb = -1447 cal/g = -60.5 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Exothermic -26.6 Btu/lb = -14.8 cal/g = -6.19 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# BARIUM CYANIDE

BCY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
57	80.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BISPHENOL A DIGLYCIDYL ETHER

BDE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bisphenol A - epichlorohydrin condensate Diglycidyl ether of Bisphenol A Epichlorohydrin resin 4,4'-Isopropylidenediphenol-diglycidyl ether	Liquid  Yellowish brown  Odorless  Sinks in water.
<b>Keep people away. Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_{21}H_{24}O_4$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 1675-54-3
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51617

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; goggles; protective clothing and protective creams. Good personal hygiene is necessary, with instruction of personnel and adequate cleaning facilities.
- 3.2 **Symptoms Following Exposure:** Contact with liquid irritates eyes. Prolonged or repeated contact with skin causes irritation and dermatitis.
- 3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min. SKIN: remove chemical with water or waterless skin cleaner.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1;  $LD_{50}$  = 5-15 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 485°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 119.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 33.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 340
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.16 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** (est.)—14,900 Btu/lb = -8,300 cal/g = -350 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BISPHENOL A DIGLYCIDYL ETHER

BDE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
51	73.000		N O T		N O T		N O T
52	72.959						
53	72.929						
54	72.900						
55	72.860		P		P		P
56	72.830		E		E		E
57	72.790		R		R		R
58	72.759		T		T		T
59	72.719		I		I		I
60	72.690		N		N		N
61	72.650		E		E		E
62	72.620		N		N		N
63	72.580		E		E		E
64	72.549		N		N		N
65	72.509						
66	72.480						
67	72.440						
68	72.410						
69	72.370						
70	72.339						
71	72.309						
72	72.270						
73	72.240						
74	72.200						
75	72.169						
76	72.129						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T		N O T		N O T
			P		P		P
			E		E		E
			R		R		R
			T		T		T
			I		I		I
			N		N		N
			E		E		E
			N		N		N

# BUTADIENE

BDI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Biethylene Bivinyll 1,3-Butadiene Divinyl Vinyl ethylene	Liquefied compressed gas Colorless Gasoline-like odor  Floats and boils on water. Flammable visible vapor cloud is produced.
<b>Restrict access.</b> <b>Avoid contact with liquid and gas.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</b> <b>Shut off ignition sources and call fire department.</b> <b>Evacuate area in case of large discharge.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	<b>FLAMMABLE.</b> Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop flow of gas if possible. Cool exposed containers and protect men effecting shut-off with water. Let fire burn.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. Move to fresh air.  <b>LIQUID</b> Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Not harmful to aquatic life. May be dangerous if it enters water intakes. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Skim; Dredge Salvage waterfowl Chemical and Physical Treatment: Burn	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 30; Olefins <b>2.2 Formula:</b> CH <sub>2</sub> = CHCH = CH <sub>2</sub> <b>2.3 IMO/UN Designation:</b> 2.0/1010 <b>2.4 DOT ID No.:</b> 1010 <b>2.5 CAS Registry No.:</b> 106-99-0 <b>2.6 NAERG Guide No.:</b> 116P <b>2.7 Standard Industrial Trade Classification:</b> 51113
<b>3. HEALTH HAZARDS</b>  <b>3.1 Personal Protective Equipment:</b> Chemical-type safety goggles; rescue harness and life line for those entering a tank or enclosed storage space; hose mask with hose inlet in a vapor-free atmosphere; self-contained breathing apparatus; rubber suit. <b>3.2 Symptoms Following Exposure:</b> Slight anesthetic effect at high concentrations; causes "frostbite" from skin contact; slight irritation to eyes and nose at high concentrations. <b>3.3 Treatment of Exposure:</b> Remove from exposure immediately. Call a physician. INHALATION: if breathing is irregular or stopped, start resuscitation, administer oxygen. SKIN CONTACT: remove contaminated clothing and wash affected skin area. EYE CONTACT: irrigate with water for 15 min. <b>3.4 TLV-TWA:</b> 2 ppm <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Currently not available <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> None <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin because of frostbite. <b>3.12 Odor Threshold:</b> 4 mg/m <sup>3</sup> <b>3.13 IDLH Value:</b> 2,000 ppm <b>3.14 OSHA PEL-TWA:</b> 1,000 ppm (Proposed value: 2 ppm) <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Proposed value: 10 ppm <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 105°F (est.)  
**4.2 Flammable Limits in Air:** 2.0%-11.5%  
**4.3 Fire Extinguishing Agents:** Stop flow of gas  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Vapors heavier than air and may travel a considerable distance to a source of ignition and flashback. Containers may explode in a fire due to polymerization.  
**4.7 Auto Ignition Temperature:** 788°F  
**4.8 Electrical Hazards:** Class 1, Group B  
**4.9 Burning Rate:** 8.0 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** Not flammable  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Explosive decomposition when contaminated with peroxides formed by reaction with air.  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Stable when inhibitors present  
**5.6 Inhibitor of Polymerization:** tert-Butylcatechol (0.01-0.02%)

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Not pertinent  
**6.2 Waterfowl Toxicity:** Not pertinent  
**6.3 Biological Oxygen Demand (BOD):** Not pertinent  
**6.4 Food Chain Concentration Potential:** Not pertinent  
**6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Research grade: 99.86 mole% Special purity: 99.5 mole% Rubber grade: 99.0mole% Commercial: 98%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Safety relief  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** 2  
**7.7 Barge Hull Type:** 2

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable gas  
**8.2 49 CFR Class:** 2.1  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	2

**8.6 EPA Reportable Quantity:** 10 pounds  
**8.7 EPA Pollution Category:** A  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Gas  
**9.2 Molecular Weight:** Currently not available  
**9.3 Boiling Point at 1 atm:** 24.1°F = -4.4°C = 268.8°K  
**9.4 Freezing Point:** -164°F = -108.9°C = 164.3°K  
**9.5 Critical Temperature:** 305.6°F = 152°C = 425.2°K  
**9.6 Critical Pressure:** 628 psia = 42.7 atm = 4.32 MN/m<sup>2</sup>  
**9.7 Specific Gravity:** 0.621 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** 13.4 dynes/cm = 0.0134 N/m at 22°C  
**9.9 Liquid Water Interfacial Tension:** (est.) 67 dynes/cm = 0.067 N/m at 22°C  
**9.10 Vapor (Gas) Specific Gravity:** 1.9 at 20°C  
**9.11 Ratio of Specific Heats of Vapor (Gas):** 1.1  
**9.12 Latent Heat of Vaporization:** 180 Btu/lb = 100 cal/g = 4.19 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -19,008 Btu/lb = -10,560 cal/g = -442.13 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** -549 Btu/lb = -305 cal/g = -12.8 X 10<sup>5</sup> J/kg  
**9.17 Heat of Fusion:** 35.28 cal/g  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 61 psia

## NOTES

# BUTADIENE

BDI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-110	45.610	-110	0.453		N	-110	0.437
-100	45.220	-100	0.459		O	-100	0.404
-90	44.840	-90	0.465		T	-90	0.375
-80	44.460	-80	0.471			-80	0.349
-70	44.080	-70	0.478		P	-70	0.326
-60	43.700	-60	0.484		E	-60	0.306
-50	43.320	-50	0.490		R	-50	0.288
-40	42.940	-40	0.496		T	-40	0.272
-30	42.550	-30	0.502		I	-30	0.258
-20	42.170	-20	0.508		N	-20	0.245
-10	41.790	-10	0.514		E	-10	0.233
0	41.410	0	0.520		N	0	0.222
10	41.030	10	0.526		T	10	0.212
20	40.650	20	0.533			20	0.203

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	-55	1.795	-55	0.02235	0	0.307
	N	-50	2.109	-50	0.02594	25	0.322
	S	-45	2.466	-45	0.02997	50	0.336
	O	-40	2.872	-40	0.03448	75	0.350
	L	-35	3.331	-35	0.03952	100	0.364
	U	-30	3.847	-30	0.04512	125	0.377
	B	-25	4.426	-25	0.05131	150	0.390
	I	-20	5.074	-20	0.05815	175	0.403
	E	-15	5.796	-15	0.06568	200	0.416
		-10	6.598	-10	0.07394	225	0.428
		-5	7.487	-5	0.08297	250	0.440
		0	8.468	0	0.09283	275	0.451
		5	9.549	5	0.10350	300	0.463
		10	10.740	10	0.11520	325	0.474
		15	12.040	15	0.12780	350	0.485
		20	13.460	20	0.14140	375	0.495
		25	15.010	25	0.15600	400	0.505
		30	16.690	30	0.17180	425	0.515
		35	18.520	35	0.18870	450	0.525
		40	20.500	40	0.20680	475	0.535
		45	22.650	45	0.22610	500	0.544
		50	24.960	50	0.24670	525	0.553
		55	27.440	55	0.26870	550	0.562
		60	30.120	60	0.29200	575	0.571
		65	32.980	65	0.31680	600	0.579
		70	36.050	70	0.34300		

# BENZYL DIMETHYLAMINE

BDM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Catalyst 9915 a-(Dimethylamino)toluene N,N-Dimethyl benzene methanamine N,N-Dimethyl benzylamine N,N-(Dimethyl) a-toluenamine	Liquid  Pale yellow to light brown  Strong amine odor  Floats on water.
Avoid contact with liquid. Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_9H_{11}N(CH_3)_2$   
2.3 IMO/UN Designation: 8/2619  
2.4 DOT ID No.: 2619  
2.5 CAS Registry No.: 103-83-3  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification:  
51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator; rubber gloves, splash proof goggles  
3.2 **Symptoms Following Exposure:** Inhalation may be fatal as a result of spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.  
3.3 **Treatment of Exposure:** INHALATION: Remove victim to fresh air and call a physician at once; administer oxygen until physician arrives. INGESTION: Get medical attention at once. EYES or SKIN: Flush with plenty of water for at least 15 min; if cyanosis is present, shower with soap and warm water, with special attention to scalp and finger nails; remove any contaminated clothing.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3;  $LD_{50}$  = 265 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
130°C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide, water spray.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Toxic vapors are generated when heated.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 63.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May attack some forms of plastics  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Store under nitrogen  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 135.21  
9.3 **Boiling Point at 1 atm:** 357.8°F = 181°C = 454.2°K  
9.4 **Freezing Point:** -103°F = -75°C = 198.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.915 at 10°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.66 (est)  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BENZYL DIMETHYLAMINE

BDM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
32	57.120		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.269 0.281 0.293 0.305 0.317 0.329 0.341 0.352 0.364 0.376 0.388 0.400 0.412 0.424 0.436 0.448 0.460 0.471 0.483 0.495 0.507 0.519 0.531 0.543 0.555

# 1,4-BUTANEDIOL

BDO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,4-Butylene glycol 1,4-Dihydroxybutane Tetramethylene glycol	Thick liquid      Colorless      Odorless  Sinks and mixes with water. Freezing point is 68°F.
Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin or eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: HOCH<sub>2</sub>(CH<sub>2</sub>)<sub>2</sub>CH<sub>2</sub>OH  
2.3 IMO/UN Designation: 3.3/1987  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 110-63-4  
2.6 NAERG Guide No.: Not listed.  
2.7 Standard Industrial Trade Classification: 51299

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Eye protection; chemical protective gloves and clothing.  
3.2 **Symptoms Following Exposure:** Slight irritation to eyes and skin. Depressant if ingested.  
3.3 **Treatment of Exposure:** EYES: flush with water for 15 minutes. SKIN: wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** None  
3.11 **Liquid or Solid Characteristics:** None  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
> 250°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 756°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Avoid contact with strong oxidizers.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Regular grade: 99%  
Anhydrous grade: 99.3%  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 90.12  
9.3 **Boiling Point at 1 atm:** 442°F = 228°C = 501°K  
9.4 **Freezing Point:** 68.2°F = 20.1°C = 293.3°K  
9.5 **Critical Temperature:** 716.0°F = 380°C = 653.2°K  
9.6 **Critical Pressure:** 720 psia = 49 atm = 5.0 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.017 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.1  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -11,900 Btu/lb  
= -6630 cal/g = -277 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# 1,4-BUTANEDIOL

BDO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
70	63.400	85	0.537	75	1.427	N O T  P E R T I N E N T	
75	63.230	90	0.545	80	1.427		
80	63.060	95	0.552	85	1.428		
85	62.880	100	0.560	90	1.428		
90	62.710	105	0.567	95	1.429		
95	62.540	110	0.575	100	1.429		
100	62.360	115	0.582	105	1.430		
105	62.190	120	0.590	110	1.430		
110	62.020	125	0.597	115	1.431		
115	61.840	130	0.605	120	1.431		
120	61.670	135	0.612	125	1.432		
125	61.500	140	0.620	130	1.432		
130	61.320	145	0.627	135	1.432		
135	61.150	150	0.635	140	1.433		
140	60.980			145	1.433		
145	60.800			150	1.434		
150	60.630			155	1.434		
155	60.460			160	1.435		
160	60.280			165	1.435		
165	60.110			170	1.436		
170	59.940			175	1.436		
175	59.760			180	1.437		
				185	1.437		
				190	1.438		
				195	1.438		
				200	1.438		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		75	0.000	75	0.00000	N O T  P E R T I N E N T	
		80	0.000	80	0.00000		
		85	0.000	85	0.00000		
		90	0.000	90	0.00001		
		95	0.000	95	0.00001		
		100	0.001	100	0.00001		
		105	0.001	105	0.00001		
		110	0.001	110	0.00001		
		115	0.001	115	0.00002		
		120	0.001	120	0.00002		
		125	0.002	125	0.00002		
		130	0.002	130	0.00003		
		135	0.003	135	0.00004		
		140	0.003	140	0.00005		
		145	0.004	145	0.00006		
		150	0.005	150	0.00007		

# BERYLLIUM CHLORIDE

BEC

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid White to green Sharp odor

Sinks and mixes violently with water.

Restrict access.  
AVOID CONTACT WITH SOLID AND DUST.  
Wear dust respirator and rubber overclothing (including gloves).  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
Irritating gases may be produced when heated.  
Wear goggles and self-contained breathing apparatus.  
DO NOT USE WATER ON ADJACENT FIRES.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
POISONOUS IF INHALED OR IF SKIN IS EXPOSED.  
If inhaled will cause coughing, difficult breathing, or loss of consciousness.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

SOLID  
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.  
Will burn skin and eyes.  
If swallowed will cause nausea, coughing, or loss of consciousness.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: BeCl<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/1566  
2.4 DOT ID No.: 1566  
2.5 CAS Registry No.: 7787-47-5  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 52329

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respiratory protection; gloves; freshly laundered clothing; chemical safety goggles
- 3.2 **Symptoms Following Exposure:** Inhalation causes pneumonitis, nasopharyngitis, tracheobronchitis, dyspnea, chronic cough. Ingestion causes irritation of mouth and stomach. Contact with dust causes conjunctival inflammation of eyes and irritation of skin. Any dramatic, unexplained weight loss should be considered as a possible first indication of beryllium disease.
- 3.3 **Treatment of Exposure:** INHALATION: chest x-ray should be taken immediately for evidence of pneumonitis. EYES: flush with water for at least 15 min.; if irritation persists, get medical attention. SKIN: cuts or puncture wounds in which beryllium may be embedded under the skin should be thoroughly cleansed immediately by a physician.
- 3.4 **TLV-TWA:** 0.002 mg/m<sup>3</sup> (as beryllium)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 0.01 mg/m<sup>3</sup> as beryllium
- 3.7 **Toxicity by Ingestion:** Grade 3; oral rat LD<sub>50</sub> = 86 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Be produces a chronic systemic disease that primarily affects the lung but also can involve other organs such as lymph nodes, liver, bones, and kidney.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 4 mg/m<sup>3</sup> as beryllium.
- 3.14 **OSHA PEL-TWA:** 0.002 mg/m<sup>3</sup> as beryllium.
- 3.15 **OSHA PEL-STEL:** 0.025 mg Be/m<sup>3</sup> 30 minute peak per 8 hour shift.
- 3.16 **OSHA PEL-Ceiling:** 0.005 mg/m<sup>3</sup> as beryllium
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water on adjacent fires.
- 4.5 **Special Hazards of Combustion**  
**Products:** Toxic and irritating beryllium oxide fumes and hydrogen chloride may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously with evolution of heat. Forms beryllium oxide and hydrochloric acid solution.
- 5.2 **Reactivity with Common Materials:** Corrodes most metals in presence of moisture. Flammable and explosive hydrogen gas may collect in enclosed spaces.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.15 ppm\* 96 hr/fathead minnow/TL<sub>50</sub>/soft fresh water  
15 ppm\* /96 hr/fathead minnow/TL<sub>50</sub>/hard fresh water  
\*as beryllium
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** Bioconcentration of 100-fold can occur under constant exposure. Not significant in spill conditions.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 79.9
- 9.3 **Boiling Point at 1 atm:** (sublimes) 968°F = 520°C = 793°K
- 9.4 **Freezing Point:** 824°F = 440°C = 713°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.90 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -1,000 Btu/lb = -557 cal/g = -23.3 X 10<sup>3</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 30 cal/g (est)
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# BERYLLIUM CHLORIDE

BEC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BERYLLIUM FLUORIDE

BEF

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid White Odorless

Sinks and mixes with water.

Restrict access.  
AVOID CONTACT WITH SOLID AND DUST.  
Wear chemical protective suit with self-contained breathing apparatus.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
POISONOUS IF INHALED, IF SWALLOWED, OR IF SKIN IS EXPOSED.  
Will burn eyes.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

SOLID  
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.  
Will burn eyes.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: BeF<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/1566  
2.4 DOT ID No.: 1566  
2.5 CAS Registry No.: 7787-49-7  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 52310

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respiratory protection; gloves; goggles
- 3.2 **Symptoms Following Exposure:** Any dramatic weight loss should be considered as possible first indication of beryllium disease. Inhalation causes irritation of nose, throat, and lungs, severe pneumonitis, and/or pulmonary edema. Ingestion causes fatigue, weakness, loss of appetite. Contact with eyes causes severe irritation and burns. Contact with skin causes dermatitis and non-healing ulcers.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air; chest x-ray should be taken immediately to detect pneumonitis, if exposure has been severe. INGESTION: induce vomiting; get medical attention. EYES: flush with water for at least 15 min.; get medical attention. SKIN: flush with water; get medical attention if skin has been broken.
- 3.4 **TLV-TWA:** 0.002 mg/m<sup>3</sup> (as beryllium)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 0.01 mg/m<sup>3</sup> as beryllium.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 100 mg/kg (mouse)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Berylliosis of lungs may occur from 3 months to 15 years after exposure. Chronic systemic diseases of the liver, spleen, lymph nodes, bone, kidney, and other organs may also occur.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 4 mg/m<sup>3</sup> as beryllium.
- 3.14 **OSHA PEL-TWA:** 0.002 mg/m<sup>3</sup> as beryllium.
- 3.15 **OSHA PEL-STEL:** 0.025 mg Be/m<sup>3</sup> 30 minute peak per 8 hour shift.
- 3.16 **OSHA PEL-Ceiling:** 0.005 mg/m<sup>3</sup> as beryllium.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating vapor of unburned material may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.15 ppm\*/96 hr/fathead minnow/TL=/  
fresh (soft) water  
15 ppm\*/96 hr/fathead minnow/TL=/  
fresh (hard) water  
\*As beryllium
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Bioconcentration of 100-fold under constant exposure only. Not significant under spill conditions.
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Purified, 99.99%; Chemically pure, 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 47
- 9.3 **Boiling Point at 1 atm:** Not pertinent (sublimes at 800°C)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.99 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -180 Btu/lb = -98 cal/g = -4.1 X 10<sup>2</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 127.6 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# BERYLLIUM FLUORIDE

BEF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	50.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BERYLLIUM

BEM

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid Silver color Odorless

Sinks in water.

Restrict access.  
AVOID CONTACT WITH SOLID AND DUST.  
Wear dust respirator and rubber overclothing (including gloves).  
Shut off ignition sources and call fire department.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Combustible.  
POISONOUS GASES MAY BE PRODUCED IN FIRE.  
Dust cloud may explode if ignited in an enclosed area.  
Wear goggles and self-contained breathing apparatus.  
Extinguish with dry graphite, soda ash, or other inert powder.  
DO NOT USE WATER ON FIRE.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
POISONOUS IF INHALED OR IF SKIN IS EXPOSED.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.  
  
SOLID  
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Be  
2.3 IMO/UN Designation: 6.1/1567  
2.4 DOT ID No.: 1567  
2.5 CAS Registry No.: 7440-41-7  
2.6 NAERG Guide No.: 134  
2.7 Standard Industrial Trade Classification: 52229

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self contained positive pressure breathing apparatus; clean work clothes daily; gloves; eye protection
- 3.2 **Symptoms Following Exposure:** Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Dust is extremely toxic when inhaled; symptoms include coughing, shortness of breath, and acute or chronic lung disease. There is no record of illness from ingestion of beryllium. Contact with dust causes conjunctival inflammation of eyes and dermatitis.
- 3.3 **Treatment of Exposure:** INHALATION: acute disease may require hospitalization with administration of oxygen; chest x-ray should be taken immediately. EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water; all cuts, scratches or other injuries should receive prompt medical attention.
- 3.4 TLV-TWA: 0.002 mg/m<sup>3</sup>  
3.5 TLV-STEL: 0.01 mg/m<sup>3</sup>  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3; oral LD<sub>50</sub> = 100 mg/kg (mouse)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 **Chronic Toxicity:** Berylliosis of lungs may occur from 3 months to 15 years after exposure. Chronic systemic diseases of the liver, spleen, lymph nodes, bone, kidney, and other organs may also occur.
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: 4 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 0.002 mg/m<sup>3</sup>  
3.15 OSHA PEL-STEL: 0.025 mg/m<sup>3</sup> 30 minute peak per 8 hour shift.  
3.16 OSHA PEL-Ceiling: 0.005 mg/m<sup>3</sup>  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Graphite, sand, or any other inert dry powder
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, CO<sub>2</sub>, or halogenated extinguishing agents.
- 4.5 **Special Hazards of Combustion Products:** Combustion yields beryllium oxide fume, which is toxic if inhaled.
- 4.6 **Behavior in Fire:** Powder may form explosive mixture with air.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 2.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 1.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Reacts with acids and alkalis to form hydrogen gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Grade AA, 99.96+%; Grade A, 99.87+%; Nuclear grade
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** P015
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 9.01
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.85 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** -28,000 Btu/lb = -15,560 cal/g = -652 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 260.0 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# BERYLLIUM

BEM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BERYLLIUM NITRATE

BEN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Beryllium nitrate trihydrate	Solid	White	Odorless
Sinks and mixes with water.			
<b>Restrict access.</b> Shut off ignition sources and call fire department. <b>AVOID CONTACT WITH SOLID AND DUST.</b> Wear dust respirator and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. <b>POISONOUS GASES MAY BE PRODUCED IN FIRE.</b> Wear goggles and self-contained breathing apparatus. Flood discharge area with water.		
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b> <b>DUST</b> <b>POISONOUS IF INHALED OR IF SKIN IS EXPOSED.</b> If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>SOLID</b> <b>POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.</b> If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If in eyes, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:** Be(NO<sub>3</sub>)<sub>2</sub>·3H<sub>2</sub>O
- 2.3 **IMO/UN Designation:** 6.1/2404
- 2.4 **DOT ID No.:** 2464
- 2.5 **CAS Registry No.:** 13597-99-4
- 2.6 **NAERG Guide No.:** 141
- 2.7 **Standard Industrial Trade Classification:** 52359

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respiratory protection; gloves; freshly laundered clothing; chemical safety goggles
- 3.2 **Symptoms Following Exposure:** Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Inhalation causes pneumonitis, nasopharyngitis, tracheobronchitis, dyspnea, chronic cough. Ingestion causes anorexia, fatigue, weakness, malaise. Contact with eyes causes conjunctival inflammation. Contact with skin causes dermatitis and non-healing ulcers.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; take chest x-ray immediately to check for pneumonitis. INGESTION: induce vomiting; get medical attention. EYES: flush with water for at least 15 min.; get medical attention. SKIN: cuts or puncture wounds in which beryllium may be embedded under the skin should be thoroughly cleansed immediately by a physician.
- 3.4 **TLV-TWA:** 0.002 mg/m<sup>3</sup> (as beryllium)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 0.01 mg/m<sup>3</sup> as beryllium.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** May cause chronic systemic disease of the lung as well as other organs such as liver, spleen, lymph nodes, bone, and kidney.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 4 mg/m<sup>3</sup> as beryllium.
- 3.14 **OSHA PEL-TWA:** 0.002 mg/m<sup>3</sup> as beryllium.
- 3.15 **OSHA PEL-STEL:** 0.025 mg Be/m<sup>3</sup> 30 minute peak per 8 hour shift.
- 3.16 **OSHA PEL-Ceiling:** 0.005 mg/m<sup>3</sup> as beryllium.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not combustible
- 4.2 **Flammable Limits in Air:** Not combustible
- 4.3 **Fire Extinguishing Agents:** Water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
**Products:** Toxic and irritating beryllium oxide and oxides of nitrogen may form in fire.
- 4.6 **Behavior in Fire:** May increase intensity of fire when in contact with combustible material
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts to form weak solution of nitric acid; the reaction is not hazardous.
- 5.2 **Reactivity with Common Materials:** In presence of moisture will damage wood and corrode most metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.15 ppm\*/96 hr/fathead minnow/TL<sub>50</sub>/soft water  
20 ppm\*/96 hr/fathead minnow/TL<sub>50</sub>/hard water  
\*as beryllium
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Bioconcentration of 100-fold can occur under constant exposure. Not significant in spill conditions.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Purified
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 205.1
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.56 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# BERYLLIUM NITRATE

BEN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	99.070		N		N		N
36	99.530		O		O		O
38	100.000		T		T		T
40	100.500						
42	100.900		P		P		P
44	101.400		E		E		E
46	101.900		R		R		R
48	102.299		T		T		T
50	102.799		I		I		I
52	103.299		N		N		N
54	103.700		E		E		E
56	104.200		N		N		N
58	104.700		E		E		E
60	105.099		N		N		N
62	105.599		T		T		T
64	106.099						
66	106.500						
68	107.000						
70	107.500						
72	107.900						
74	108.400						
76	108.900						
78	109.299						
80	109.799						
82	110.299						
84	110.700						

# BERYLLIUM OXIDE

BEO

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms Beryllia Bromelite		Solid	White	Odorless
		Sinks in water.		
Restrict access. Shut off ignition sources and call fire department. AVOID CONTACT WITH SOLID AND DUST. Wear Dust respirator and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.				
Fire	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.			
Exposure	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. If inhaled will cause coughing and difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: BeO
- 2.3 IMO/UN Designation: 6.1/1566
- 2.4 DOT ID No.: 1566
- 2.5 CAS Registry No.: 1304-56-9
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respiratory protection; gloves; freshly laundered clothing; chemical safety goggles
- 3.2 **Symptoms Following Exposure:** Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Other symptoms include anorexia, fatigue, weakness, malaise. Inhalation causes pneumonitis, nasopharyngitis, tracheobronchitis, dyspnea, chronic cough. Contact with dust causes conjunctival inflammation of eyes and irritation of skin.
- 3.3 **Treatment of Exposure:** INHALATION: take chest x-ray immediately to check for pneumonitis. INGESTION: induce vomiting; get medical attention. EYES: flush with water for at least 15 min.; get medical attention. SKIN: cuts or puncture wounds in which beryllium may be embedded under the skin should be thoroughly cleansed immediately by a physician.
- 3.4 **TLV-TWA:** 0.002 mg/m<sup>3</sup> (as beryllium)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 0.01 mg/m<sup>3</sup> as beryllium.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Beryllium disease may occur in lymph nodes, liver, spleen, kidney, etc. as well as lung.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 4 mg/m<sup>3</sup> as beryllium.
- 3.14 **OSHA PEL-TWA:** 0.002 mg/m<sup>3</sup> as beryllium.
- 3.15 **OSHA PEL-STEL:** 0.025 mg Be/m<sup>3</sup> 30 minute peak per 8 hour shift.
- 3.16 **OSHA PEL-Ceiling:** 0.005 mg/m<sup>3</sup> as beryllium.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic beryllium oxide fume may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Bioconcentration of 100-fold can occur under constant exposure. Not significant in spill conditions.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; Nuclear
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 25
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 3.0 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 679.7 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BERYLLIUM OXIDE

BEO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BERYLLIUM SULFATE

BES

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms Beryllium sulfate tetrahydrate		Solid	White	Odorless
		Sinks and mixes with water		
Restrict access. AVOID CONTACT WITH SOLID AND DUST, Wear dust respirator and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.				
Fire	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.			
Exposure	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: BeSO <sub>4</sub> ·4H <sub>2</sub> O 2.3 IMO/UN Designation: 6.1/1566 2.4 DOT ID No.: 1566 2.5 CAS Registry No.: 13510-49-1 2.6 NAERG Guide No.: 154 2.7 Standard Industrial Trade Classification: 52349
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Respiratory protection; gloves; freshly laundered clothing; chemical safety goggles 3.2 <b>Symptoms Following Exposure:</b> Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Other symptoms include anorexia, fatigue, weakness, malaise. Inhalation causes pneumonitis, nasopharyngitis, tracheobronchitis, dyspnea, chronic cough. Contact with eyes causes conjunctival inflammation. Contact with skin causes dermatitis of primary irritant or sensitization type; causes ulcer formation when in contact with cuts. 3.3 <b>Treatment of Exposure:</b> INHALATION: take chest x-ray immediately to check for evidence of pneumonitis. INGESTION: induce vomiting; get medical attention. EYES: flush with water for at least 15 min.; get medical attention. SKIN: cuts or puncture wounds in which beryllium may be embedded under the skin should be thoroughly cleansed immediately by a physician. 3.4 <b>TLV-TWA:</b> 0.002 mg/m <sup>3</sup> as beryllium 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> 0.01 mg/m <sup>3</sup> as beryllium. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; oral rat LD <sub>50</sub> = 82 mg/kg 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Beryllium disease may occur in the lymph nodes, liver, spleen, kidney, etc., as well as lung. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 4 mg/m <sup>3</sup> as beryllium. 3.14 <b>OSHA PEL-TWA:</b> 0.002 mg/m <sup>3</sup> as beryllium. 3.15 <b>OSHA PEL-STEL:</b> 0.025 mg Be/m <sup>3</sup> 30 minute peak per 8 hour shift. 3.16 <b>OSHA PEL-Ceiling:</b> 0.005 mg/m <sup>3</sup> as beryllium. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic beryllium oxide and sulfuric acid fumes may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Solid
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
11 ppm/96 hr/fathead minnow/TL<sub>m</sub>/hard fresh water  
0.2 ppm/96 hr/fathead minnow/TL<sub>m</sub>/soft fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Bioconcentration of 100-fold can occur under constant exposure. Not significant in spill conditions.
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** High purity; Analytical grade
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 177.14
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.71 at 11°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -11 Btu/lb = -6 cal/g = -0.3 X 10<sup>3</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# BERYLLIUM SULFATE

BES

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	26.110		N		N		N
36	26.220		O		O		O
38	26.330		T		T		T
40	26.440						
42	26.560		P		P		P
44	26.670		E		E		E
46	26.780		R		R		R
48	26.890		T		T		T
50	27.000		I		I		I
52	27.110		N		N		N
54	27.220		E		E		E
56	27.330		N		N		N
58	27.440		E		E		E
60	27.560		N		N		N
62	27.670		T		T		T
64	27.780						
66	27.890						
68	28.000						
70	28.110						
72	28.220						
74	28.330						
76	28.440						
78	28.560						
80	28.670						
82	28.780						
84	28.890						

# N-BUTYL FORMATE

BFN

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid

Colorless

Floats on water.

Restrict access.  
Wear full impervious protective clothing and approved respirator.  
Shut off all possible sources of ignition.  
Call fire department.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Flammable.  
Vapors can flow to distant ignition source and flash back.  
Wear full protective clothing with self-contained breathing apparatus.  
Extinguish fire with dry chemical, alcohol foam, carbon dioxide.  
Use water spray to cool exposed containers.

### Exposure

CALL FOR MEDICAL AID.

#### VAPOR

Move victim to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

#### LIQUID

Irritating to skin and eyes.  
Overexposures may have a narcotic effect.  
Remove contaminated clothing and shoes.  
Wash affected areas with soap and water.  
IF IN EYES, hold eyelids open and flush with plenty of water.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $\text{HCOO}(\text{CH}_2)_3\text{CH}_3$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: 1128  
2.5 CAS Registry No.: 592-84-7  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51374

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.  
3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat. High concentrations have a narcotic effect.  
3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rabbit  $\text{LD}_{50} = 2.656 \text{ g/kg}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 64°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Vapors can flow along surfaces to distant ignition source and flash back.  
4.7 **Auto Ignition Temperature:** 612°F.  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (1)  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%; technical.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 102.15  
9.3 **Boiling Point at 1 atm:** 224.6°F = 107°C = 380°K  
9.4 **Freezing Point:** -130°F = -90°C = 183°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.885 - 0.9108  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# N-BUTYL FORMATE

BFN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	7.440		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# N-BUTYL CHLOROFORMATE

BFO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Butyl chlorocarbonate Carbonochloridic acid, butyl ester Chlorocarboxonic acid, n-butyl ester Chloroformic acid, n-butyl ester	Liquid  Colorless to light yellow  Unpleasant odor  Sinks and reacts in water. Flammable, irritating vapor is produced.
<b>Shut off ignition sources. Call fire department. Avoid contact with liquid and vapor. Keep people away. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with water, dry chemical, alcohol foam, carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Dilute and disperse Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>4</sub> H <sub>9</sub> ClO <sub>2</sub> 2.3 IMO/UN Designation: 6.1/2743 2.4 DOT ID No.: 2743 2.5 CAS Registry No.: 592-34-7 2.6 NAERG Guide No.: 155 2.7 Standard Industrial Trade Classification: 51374
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> NIOSH approved airline respirator with full face piece; chemical protective gloves and clothing. 3.2 <b>Symptoms Following Exposure:</b> Inhalation of vapor irritates nose and throat and can cause delayed pulmonary edema. Liquid irritates eyes and causes severe skin burns and irreversible skin damage if allowed to remain. Can cause blindness. Ingestion causes burns of mouth and stomach. 3.3 <b>Treatment of Exposure:</b> INHALATION: Remove victim from exposure; if breathing stops, administer artificial respiration; If breathing is difficult, give oxygen; call physician. EYES: Irrigate with copious amounts of water for at least 15 min.; call physician if needed. SKIN: Flush with water for 15 min.; get medical attention for burns. INGESTION: Give large amounts of water; do NOT induce vomiting; get medical attention. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Currently not available 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 77°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Water, dry chemical, alcohol foam, carbon dioxide.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Irritating and toxic hydrogen chloride and phosgene may be formed.  
4.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flashback.  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 28.6 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 10.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts slowly, evolving hydrogen chloride (hydrochloric acid). Reaction can be hazardous if water is hot.  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Flood with water, rinse with sodium bicarbonate or lime solution.  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 97 + %  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 136.58  
9.3 Boiling Point at 1 atm: 280.4°F = 138°C = 411.2°K  
9.4 Freezing Point: Currently not available  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.0513 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 4.72  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES



# N-BUTYL CHLOROFORMATE

BFO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	65.630		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.226 0.233 0.239 0.246 0.253 0.259 0.266 0.273 0.279 0.286 0.293 0.299 0.306 0.312 0.319 0.326 0.332 0.339 0.346 0.352 0.359 0.366 0.372 0.379 0.386

# N-BUTYL GLYCIDYL ETHER

BGE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Butoxy-2,3-epoxypropane 1,2-Epoxy-3-butoxy propane 2,3-Epoxypropyl butyl ether	Liquid Colorless to pale yellow Strong, slightly unpleasant
<b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear rubber over clothing (including gloves) and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE. Wear self-contained breathing apparatus and chemical protective clothing. Extinguish with dry chemical, CO <sub>2</sub> , or alcohol foam.
<b>Exposure</b>	CALL FOR MEDICAL AID. Move victim to fresh air. Remove contaminated clothing and shoes. Wash affected areas with plenty of soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, induce vomiting.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Dilute and disperse	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: CH <sub>3</sub> (CH <sub>2</sub> ) <sub>4</sub> OCH <sub>2</sub> CHOCH <sub>2</sub> 2.3 IMO/UN Designation: Not listed. 2.4 DOT ID No.: Not listed. 2.5 CAS Registry No.: 2426-08-6 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51616
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Chemical protective clothing, gloves, face shields, and approved respirator. 3.2 <b>Symptoms Following Exposure:</b> Exposure can cause mild irritation of skin, eyes, nose, and respiratory tract. Chronic exposure may cause inflammation and sensitization of the skin. 3.3 <b>Treatment of Exposure:</b> Remove the victim from further exposure and send for medical assistance. If necessary, remove contaminated clothes and shoes. EYES: Flush immediately with large amounts of water, lifting lids occasionally. SKIN: Wash immediately with soap and water. INGESTION: Induce vomiting. INHALATION: Administer artificial respiration if required. 3.4 TLV-TWA: 25 ppm. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 2.05 g/kg(rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Mutagenic in bacterial test systems, and DNA damage was induced in vitro in human white blood cells. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 3.11 <b>Liquid or Solid Characteristics:</b> Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 250 ppm. 3.14 OSHA PEL-TWA: 50 ppm. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 130°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Solid stream of water may cause frothing.  
4.5 **Special Hazards of Combustion Products:** May form explosive peroxides upon contact with air. Toxic fumes such as carbon monoxide may be produced.  
4.6 **Behavior in Fire:** May polymerize, generating heat and causing the container to burst.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** May cause some plastics, coatings, and rubbers (insulators) to deteriorate.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 45.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Contact with strong oxidizers may cause fires and explosions. Contact with strong caustics may cause polymerization with the release of heat, which may cause the container to burst.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Contact with strong caustics or heat may cause polymerization with the liberation of heat.  
5.6 **Inhibitor of Polymerization:** Not listed.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97-99%  
7.2 **Storage Temperature:** < 75°F.  
7.3 **Inert Atmosphere:** Nitrogen blanket.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U041  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 130.21  
9.3 **Boiling Point at 1 atm:** 327°F = 164°C = 437°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.91  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# N-BUTYL GLYCIDYL ETHER

BGE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	77	2.000

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.000	68	0.058	68	0.00133		C U R R E N T L Y  N O T  A V A I L A B L E

# GAMMA-BENZENE HEXACHLORIDE

BHC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> BHC Gammexane 1,2,3,4,5,6- Hexachlorocyclohexane Lindane Tri-6	Solid crystals or powder, or solution  Solid is light to dark brown  Musty odor  Solid sinks in water. Solution generally floats on water.
<b>Restrict access.</b> <b>Avoid contact with liquid and solid.</b> <b>Wear goggles and self-contained breathing apparatus.</b> <b>Call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Solid not flammable, but usually dissolved in combustible liquid. POISONOUS GASES ARE PRODUCED WHEN SOLID IS HEATED OR WHEN SOLUTION BURNS. Wear goggles and self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR SOLUTION POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Dredge  
Chemical and Physical Treatment:  
Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** (CHCl)<sub>6</sub>  
2.3 **IMO/UN Designation:** 6.1/2761  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 58-89-9  
2.6 **NAERG Guide No.:** Not listed.  
2.7 **Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Currently not available
- 3.2 **Symptoms Following Exposure:** Hyperirritability and central nervous excitation: notably vomiting, restlessness, muscle spasms, ataxia, and clonic and tonic convulsions. Subsequent central nervous depression leading to respiratory failure. Occasional dermatitis and urticaria.
- 3.3 **Treatment of Exposure:** Gastric lavage and saline cathartics (not oil laxatives because they promote absorption). Sedatives: pentobarbital or phenobarbital in amounts adequate to control convulsions. Calcium gluconate intravenously may be used in conjunction with sedatives to control convulsions. Rest and quiet. Do NOT use epinephrine because ventricular fibrillation may result.
- 3.4 **TLV-TWA:** 0.5 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Gamma isomer (Lindane): Grade 3; LD<sub>50</sub> 50 to 500 mg/kg (rat) Technical mixture: Grade 2; LD<sub>50</sub> 0.5 to 5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Mutagen to human lymphocytes.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Moderately irritating. Personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 50 mg/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 0.5 mg/m<sup>3</sup> (skin)
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic gases are generated when solid is heated or when solution burns.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.77 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water  
0.138 ppm/96 hr/guppy/TL<sub>50</sub>/fresh water  
0.034 ppm/10 hr/coho fry/100% lethal/salt water
- 6.2 **Waterfowl Toxicity:** 2000 mg/kg
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
High
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Fortified grade: 40-45% gamma isomer Lindane: pure gamma isomer
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** U129
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 290.83
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.891 at 19°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# GAMMA-BENZENE HEXACHLORIDE

BHC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.001		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# TERT-BUTYL HYDROPEROXIDE

BHP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cadox TBH	Watery liquid Colorless Odorless  Floats and mixes slowly with water.
<b>Restrict access.</b> <b>Evacuate area in case of large discharge.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and flood spill area with water.</b> <b>Avoid contact with liquid.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	<b>FLAMMABLE.</b> May explode if subjected to heat, flame, or shock. May cause fire and explode on contact with combustibles. Vapor may explode if ignited in an enclosed area. Evacuate surrounding area. Combat fires from safe distance or protected location. Flood discharge area with water. Extinguish with dry chemical, foam or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** (CH<sub>3</sub>)<sub>3</sub>C O<sub>2</sub>OH  
2.3 **IMO/UN Designation:** 5.2/1949  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 75-91-2  
2.6 **NAERG Guide No.:** 147  
2.7 **Standard Industrial Trade Classification:** 51699

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles, well-fitting gloves, barrier creams  
3.2 **Symptoms Following Exposure:** Liquid causes severe burns of skin and eyes.  
3.3 **Treatment of Exposure:** INGESTION: induce vomiting and follow with gastric lavage. INHALATION: remove individual from contaminated atmosphere; give artificial respiration and oxygen if needed. SKIN, EYE, AND MUCOUS MEMBRANE CONTACT: flood affected tissues with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Powerful irritant of skin and eyes.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 100°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** May explode in fire  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Reacts vigorously with easily oxidized materials, including wood and some metals.  
5.3 **Stability During Transport:** Shock and heat-sensitive; self-accelerating decomposition at 200°F.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 70-90%  
7.2 **Storage Temperature:** 65-85°F  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Forbidden  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	4
Special (White).....	OX

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 90.12  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** -31°F = -35°C = 238°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.880 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -13,000 Btu/lb = -7200 cal/g = -300 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** -675 Btu/lb = -375 cal/g = -15.7 X 10<sup>5</sup> J/kg  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TERT-BUTYL HYDROPEROXIDE

BHP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	55.800	85	0.585	32	1.179	77	7.000
54	55.730	90	0.591	34	1.179		
56	55.660	95	0.597	36	1.179		
58	55.590	100	0.603	38	1.179		
60	55.520	105	0.610	40	1.179		
62	55.450	110	0.616	42	1.179		
64	55.380	115	0.622	44	1.179		
66	55.310	120	0.628	46	1.179		
68	55.240	125	0.635	48	1.179		
70	55.170	130	0.641	50	1.179		
72	55.100	135	0.647	52	1.179		
74	55.040	140	0.653	54	1.179		
76	54.970	145	0.660	56	1.179		
78	54.900	150	0.666	58	1.179		
80	54.830			60	1.179		
82	54.760			62	1.179		
84	54.690			64	1.179		
86	54.620			66	1.179		
				68	1.179		
				70	1.179		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	8.000	32	0.019	32	0.00032		N
		34	0.021	34	0.00036		O
		36	0.024	36	0.00041		T
		38	0.028	38	0.00047		
		40	0.032	40	0.00053		P
		42	0.036	42	0.00061		E
		44	0.041	44	0.00069		R
		46	0.047	46	0.00078		T
		48	0.054	48	0.00089		I
		50	0.061	50	0.00100		N
		52	0.069	52	0.00113		E
		54	0.078	54	0.00128		N
		56	0.089	56	0.00145		T
		58	0.101	58	0.00163		
		60	0.114	60	0.00184		
		62	0.129	62	0.00207		
		64	0.145	64	0.00233		
		66	0.164	66	0.00262		
		68	0.185	68	0.00294		
		70	0.208	70	0.00330		

# TERT-BUTYL HYDROPEROXIDE

BHP

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms			
Cadox TBH			
Watery liquid		Colorless	Odorless
Floats and mixes slowly with water.			
<div>Restrict access.</div> <div>Evacuate area in case of large discharge.</div> <div>Shut off ignition sources and call fire department.</div> <div>Stay upwind and flood spill area with water.</div> <div>Avoid contact with liquid.</div> <div>Notify local health and pollution control agencies.</div> <div>Protect water intakes.</div>			
Fire	<div>FLAMMABLE.</div> <div>May explode if subjected to heat, flame, or shock.</div> <div>May cause fire and explode on contact with combustibles.</div> <div>Vapor may explode if ignited in an enclosed area.</div> <div>Evacuate surrounding area.</div> <div>Combat fires from safe distance or protected location.</div> <div>Flood discharge area with water.</div> <div>Extinguish with dry chemical, foam or carbon dioxide.</div> <div>Cool exposed containers with water.</div>		
Exposure	<div>CALL FOR MEDICAL AID.</div> <div>VAPOR</div> <div>Irritating to eyes, nose and throat.</div> <div>Move to fresh air.</div> <div>If breathing has stopped, give artificial respiration.</div> <div>If breathing is difficult, give oxygen.</div> <div>LIQUID</div> <div>Irritating to skin and eyes.</div> <div>Harmful if swallowed.</div> <div>Remove contaminated clothing and shoes.</div> <div>Flush affected areas with plenty of water.</div> <div>IF IN EYES, hold eyelids open and flush with plenty of water.</div> <div>IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting.</div> <div>IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</div>		
Water Pollution	<div>Effect of low concentrations on aquatic life is unknown.</div> <div>May be dangerous if it enters water intakes.</div> <div>Notify local health and pollution control officials.</div> <div>Notify operators of nearby water intakes.</div>		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed  
2.2 Formula:  $(CH_3)_3C O_2 OH$   
2.3 IMO/UN Designation: 5.2/1949  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 75-91-2  
2.6 NAERG Guide No.: 147  
2.7 Standard Industry Trade Classification: 51699

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles, well-fitting gloves, barrier creams  
3.2 Symptoms Following Exposure: Liquid causes severe burns of skin and eyes.  
3.3 Treatment of Exposure: INGESTION: induce vomiting and follow with gastric lavage. INHALATION: remove individual from contaminated atmosphere; give artificial respiration and oxygen if needed. SKIN, EYE, AND MUCOUS MEMBRANE CONTACT: flood affected tissues with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3;  $LD_{50} = 50$  to 500 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Powerful irritant of skin and eyes.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 100°F O.C.  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Dry chemical, foam or carbon dioxide.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: May explode in fire  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 26.2 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 9.0 (calc.)  
4.14 Maximum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity in Water: No reaction  
5.2 Reactivity with Common Materials: Reacts vigorously with easily oxidized materials, including wood and some metals.  
5.3 Stability During Transport: Shock and heat-sensitive; self-accelerating decomposition at 200°F.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: 70-90%  
7.2 Storage Temperature: 65-85°F  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Forbidden  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	4
Instability (Yellow)	4
Special (White)	OX

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 90.12  
9.3 Boiling Point at 1 atm: Decomposes  
9.4 Freezing Point: -31°F = -35°C = 238°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.880 at 25°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -13,000 Btu/lb = -7200 cal/g = -300 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: -675 Btu/lb = -375 cal/g = -15.7 X 10<sup>3</sup> J/kg  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES



# TERT-BUTYL HYDROPEROXIDE

BHP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	55.800	85	0.585	32	1.179	77	7.000
54	55.730	90	0.591	34	1.179		
56	55.660	95	0.597	36	1.179		
58	55.590	100	0.603	38	1.179		
60	55.520	105	0.610	40	1.179		
62	55.450	110	0.616	42	1.179		
64	55.380	115	0.622	44	1.179		
66	55.310	120	0.628	46	1.179		
68	55.240	125	0.635	48	1.179		
70	55.170	130	0.641	50	1.179		
72	55.100	135	0.647	52	1.179		
74	55.040	140	0.653	54	1.179		
76	54.970	145	0.660	56	1.179		
78	54.900	150	0.666	58	1.179		
80	54.830			60	1.179		
82	54.760			62	1.179		
84	54.690			64	1.179		
86	54.620			66	1.179		
				68	1.179		
				70	1.179		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	8.000	32	0.019	32	0.00032		N
		34	0.021	34	0.00036		O
		36	0.024	36	0.00041		T
		38	0.028	38	0.00047		
		40	0.032	40	0.00053		P
		42	0.036	42	0.00061		E
		44	0.041	44	0.00069		R
		46	0.047	46	0.00078		T
		48	0.054	48	0.00089		I
		50	0.061	50	0.00100		N
		52	0.069	52	0.00113		E
		54	0.078	54	0.00128		N
		56	0.089	56	0.00145		T
		58	0.101	58	0.00163		
		60	0.114	60	0.00184		
		62	0.129	62	0.00207		
		64	0.145	64	0.00233		
		66	0.164	66	0.00262		
		68	0.185	68	0.00294		
		70	0.208	70	0.00330		

# ISOBUTYL ISOBUTYRATE

BIB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Liquid	Colorless	Fruity odor
	Floats on water.		
Wear full impervious protective clothing and approved respirator. Shut off all possible sources of ignition. Call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Flammable. Vapors can flow to distant ignition source and flash back. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Clean shore line Salvage waterfowl Chemical and Physical Treatment: Burn	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 34; Esters <b>2.2 Formula:</b> (CH <sub>3</sub> ) <sub>2</sub> CHCOOCH <sub>2</sub> CH(CH <sub>3</sub> ) <sub>2</sub> <b>2.3 IMO/UN Designation:</b> Currently not available <b>2.4 DOT ID No.:</b> Not listed <b>2.5 CAS Registry No.:</b> 97-85-8 <b>2.6 NAERG Guide No.:</b> Not listed. <b>2.7 Standard Industrial Trade Classification:</b> 51375
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors. <b>3.2 Symptoms Following Exposure:</b> Exposure can cause irritation of eyes, nose and throat. Toxic by inhalation. <b>3.3 Treatment of Exposure:</b> Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; oral rat LD <sub>50</sub> = 12.8 g/kg <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 99°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water.  
**4.5 Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
**4.6 Behavior in Fire:** Vapors can flow along surfaces to distant ignition source and flash back.  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Not listed.  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction.  
**5.2 Reactivity with Common Materials:** Currently not available  
**5.3 Stability During Transport:** Stable.  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent.  
**5.5 Polymerization:** Will not polymerize.  
**5.6 Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 99%; technical.  
**7.2 Storage Temperature:** Ambient.  
**7.3 Inert Atmosphere:** No requirement.  
**7.4 Venting:** Pressure vacuum valve.  
**7.5 IMO Pollution Category:** B  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed  
**8.2 49 CFR Class:** Not pertinent  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** Yes  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 144.24  
**9.3 Boiling Point at 1 atm:** 299.7°F = 148.7°C = 421.7°K  
**9.4 Freezing Point:** -113.3°F = -80.7°C = 192.3°K  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 0.853 - 0.857 @ 20°C.  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** Currently not available  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Not pertinent.  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# ISOBUTYL ISOBUTYRATE

BIB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	7.100		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# BUTYL LACTATE

BLE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butyl a-hydroxypropionate	Liquid	Clear	Mild, characteristic odor
<b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Restrict access. Wear rubber over clothing (including gloves) and safety glasses. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	<b>COMBUSTIBLE.</b> Extinguish with dry chemical, CO <sub>2</sub> , or alcohol foam. Use water spray to "knock down" vapors and cool exposed containers.		
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b> Move victim to fresh air. Remove contaminated clothing and shoes. Flush affected areas with plenty of soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effects of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
 2.2 **Formula:** CH<sub>3</sub>CH(OH)COO(CH<sub>2</sub>)<sub>4</sub>CH<sub>3</sub>  
 2.3 **IMO/UN Designation:** Not listed.  
 2.4 **DOT ID No.:** Not listed.  
 2.5 **CAS Registry No.:** 138-22-7  
 2.6 **NAERG Guide No.:** Not listed  
 2.7 **Standard Industrial Trade Classification:** 51391

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; chemical splash goggles; respiratory protection in accordance with NIOSH.
- 3.2 **Symptoms Following Exposure:** Irritation to the skin and eyes, headache, coughing, possible sleepiness, nausea or vomiting, dizziness.
- 3.3 **Treatment of Exposure:** CALL FOR MEDICAL AID. SKIN: Wash skin with soap and water for 15 minutes. EYES: Flush eyes with copious amounts of water for 15 minutes, occasionally lifting lids with fingers.
- 3.4 **TLV-TWA:** 5 ppm.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 160°F O.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Not listed.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Avoid contact with strong oxidizing agents and strong bases.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 146.19
- 9.3 **Boiling Point at 1 atm:** 370.4°F = 188°C = 461°K
- 9.4 **Freezing Point:** 18.4°F = -28°C = 245°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.98
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 5.04
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**
- Bioaccumulation: 0
- Damage to living resources: 1
- Human Oral hazard: 2
- Human Contact hazard: II
- Reduction of amenities: X

### NOTES

# BUTYL LACTATE

BLE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	4.360	68	0.008	68	0.00020		C U R R E N T L Y  N O T  A V A I L A B L E

# BENZYLTRIMETHYLAMMONIUM CHLORIDE

BMA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> BTMAC Trimethylbenzylammonium chloride	Liquid	Light yellow	Mild almond odor
May float or sink in water.			
Restrict access. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $C_6H_5CH_2N(CH_3)_3Cl \cdot H_2O$ 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51129
<b>3. HEALTH HAZARDS</b> 3.1 Personal Protective Equipment: Goggles and rubber gloves 3.2 Symptoms Following Exposure: Ingestion causes gastrointestinal disturbances. Contact with liquid irritates eyes and may irritate skin. 3.3 Treatment of Exposure: INGESTION: give large amount of water; get medical attention. EYES: flush with water for at least 15 min.; if irritation continues, get medical attention. SKIN: flush well with water. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 3; $LD_{50}$ = 50-500 mg/kg 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective on fire.  
4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen and hydrochloric acid fumes may form in fire.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 70.2 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 20.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 50-60% solution in water  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 172 (solute)  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.07 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# BENZYLTRIMETHYLAMMONIUM CHLORIDE

BMA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	67.349		N O T		N O T		N O T
54	67.280						
56	67.209						
58	67.139						
60	67.070						
62	67.000		P		P		P
64	66.929		E		E		E
66	66.860		R		R		R
68	66.790		T		T		T
70	66.719		I		I		I
72	66.650		N		N		N
74	66.580		E		E		E
76	66.509		N		N		N
78	66.440		T		T		T
80	66.379						
82	66.309						
84	66.240						
86	66.169						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T		N O T		N O T
			P		P		P
			E		E		E
			R		R		R
			T		T		T
			I		I		I
			N		N		N
			E		E		E
			N		N		N
			T		T		T

# ISOBUTYL METHACRYLATE

BMI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isobutyl alpha-methacrylate Isobutyl 2-methyl-2-propenoate Methacrylic acid, isobutyl ester	Liquid  Colorless  Acrylic odor  Floats on water.
<b>AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources. Call fire department. Avoid contact with liquid or vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Sealed containers may rupture explosively when exposed to heat. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or alcohol foam; large fires: water spray, fog or alcohol foam. Cool exposed containers with water. Combat fires from a safe distance or protected location.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to skin and eyes. Move to fresh air.  LIQUID Irritating to skin and eyes. Harmful if swallowed. IF IN EYES OR ON SKIN, flush with running water for at least 15 min; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Fouling to shoreline. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 14; Acrylates  
2.2 Formula:  $\text{CH}_2=\text{C}(\text{CH}_3)\text{CO}_2\text{CH}_2\text{CH}(\text{CH}_3)_2$   
2.3 IMO/UN Designation: 3.3/2283  
2.4 DOT ID No.: 2283  
2.5 CAS Registry No.: 97-96-9  
2.6 NAERG Guide No.: 130P  
2.7 Standard Industrial Trade Classification: 51373

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** May be harmful if inhaled; may cause dizziness or suffocation. Irritating to skin and eyes. Harmful if swallowed.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min; hold eyelids open if necessary. Wash skin with soap and water. INGESTION: If CONSCIOUS, have victim drink milk or water. Do not induce vomiting. If UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 11.99 g/kg (mouse)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Teratogen
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 120°F O.C. 112°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or alcohol foam; large fires: water spray, fog or alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Thermal decomposition may yield oxides of carbon.
- 4.6 **Behavior in Fire:** Combustible liquid. Sealed containers may rupture explosively when exposed to heat, due to polymerization.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Class I, Group D
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable. Store away from heat, catalysts and strong oxidizing agents.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Will occur with elevated temperatures and on contact with oxidizing agents.
- 5.6 **Inhibitor of Polymerization:** 25 ppm hydroquinone monomethyl ether, 10 ppm p-methoxy phenol (MEHQ)

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 100%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-Vacuum
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 142.20
- 9.3 **Boiling Point at 1 atm:** 311°F = 155°C = 428°K
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** 642°F = 339°C = 612°K (est.)
- 9.6 **Critical Pressure:** 387 psia = 26.3 atm = 2.66 MN/m<sup>2</sup> (est.)
- 9.7 **Specific Gravity:** 0.8858 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 4.9 (est.)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ISOBUTYL METHACRYLATE

BMI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	55.300		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	68	0.030	68	0.00087		C U R R E N T L Y  N O T  A V A I L A B L E

# N-BUTYL METHACRYLATE

BMN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butyl methacrylate Butyl 2-methacrylate n-Butyl alpha-methylacrylate Butyl 2-methyl-2-propenoate Methacrylic acid, butyl ester	Liquid  Colorless  Mild odor  Floats on water.
<b>Keep people away. Call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. Containers may explode in fire. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 14; Acrylates  
2.2 Formula:  $\text{CH}_2=\text{C}(\text{CH}_3)\text{COOCH}_2\text{CH}_2\text{CH}_2\text{CH}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2227  
2.5 CAS Registry No.: 97-88-1  
2.6 NAERG Guide No.: 129P  
2.7 Standard Industrial Trade Classification: 51373

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation may cause nausea because of offensive odor. Contact with liquid causes irritation of eyes and mild irritation of skin. Ingestion causes irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; give oxygen or artificial respiration as required. EYES: flush with copious amounts of water for 15 min. and consult physician. SKIN: wash with soap and water. INGESTION: do not induce vomiting; call a physician.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 0;  $\text{LD}_{50}$  > 15 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Birth defects in rats (gross and skeletal abnormalities)
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 130°F O.C.
- 4.2 **Flammable Limits in Air:** (est.) 2%-8%
- 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode due to polymerization.
- 4.7 **Auto Ignition Temperature:** 562°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 4.8 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** May occur when heated.
- 5.6 **Inhibitor of Polymerization:** 9-15 ppm monomethyl ether of hydroquinone 90-120 ppm hydroquinone

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98.5+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 142.2
- 9.3 **Boiling Point at 1 atm:** 325°F = 163°C = 436°K
- 9.4 **Freezing Point:** <32°F = <0°C = <273°F
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.8975 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 35 dynes/cm = 0.035 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -14,800 Btu/lb = -8,230 cal/g = -344 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** -180 Btu/lb = -100 cal/g = -4.2 X 10<sup>5</sup> J/kg
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Low

### NOTES

# N-BUTYL METHACRYLATE

BMN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
54	56.410	60	0.460	60	1.048	60	3.575
56	56.340	61	0.460	61	1.048	61	3.525
58	56.270	62	0.460	62	1.048	62	3.476
60	56.200	63	0.460	63	1.048	63	3.428
62	56.140	64	0.460	64	1.048	64	3.381
64	56.070	65	0.460	65	1.048	65	3.335
66	56.000	66	0.460	66	1.048	66	3.290
68	55.930	67	0.460	67	1.048	67	3.245
70	55.860	68	0.460	68	1.048	68	3.201
72	55.790	69	0.460	69	1.048	69	3.158
74	55.720	70	0.460	70	1.048	70	3.116
76	55.650	71	0.460	71	1.048	71	3.074
78	55.590	72	0.460	72	1.048	72	3.033
80	55.520	73	0.460	73	1.048	73	2.993
82	55.450	74	0.460	74	1.048	74	2.954
84	55.380	75	0.460	75	1.048	75	2.915
86	55.310	76	0.460	76	1.048	76	2.877
88	55.240	77	0.460	77	1.048	77	2.839
90	55.170						
92	55.110						
94	55.040						
96	54.970						
98	54.900						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.081	70	0.00203		N
	N	80	0.109	80	0.00268		O
	S	90	0.145	90	0.00350		T
	O	100	0.191	100	0.00453		
	L	110	0.250	110	0.00581		P
	U	120	0.323	120	0.00737		E
	B	130	0.413	130	0.00928		R
	L	140	0.525	140	0.01160		T
	E	150	0.662	150	0.01438		I
		160	0.828	160	0.01770		N
		170	1.028	170	0.02163		E
		180	1.269	180	0.02627		N
		190	1.555	190	0.03171		T
		200	1.895	200	0.03805		
		210	2.295	210	0.04540		
		220	2.764	220	0.05387		
		230	3.311	230	0.06359		
		240	3.945	240	0.07469		
		250	4.678	250	0.08732		
		260	5.521	260	0.10160		
		270	6.486	270	0.11780		
		280	7.587	280	0.13590		
		290	8.838	290	0.15620		
		300	10.250	300	0.17880		
		310	11.850	310	0.20400		
		320	13.640	320	0.23180		

# BUTYRONITRILE

BNI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butanenitrile Butyric acid nitrile Cyanopropane Propyl cyanide	Liquid	Colorless	Sharp suffocating odor
<b>AVOID CONTACT WITH LIQUID OR VAPOR. EVACUATE AREA.</b> Shut off all sources of ignition, call fire department. Wear self-contained breathing apparatus and protective clothing. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE Toxic fumes are released in fire. Flashback may occur along vapor trail. Containers may explode under fire conditions. Extinguish with dry chemical, alcohol foam, CO <sub>2</sub> . Wear self-contained breathing apparatus and protective clothing.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, throat and skin. IF INHALED: remove to fresh air. If not breathing, give artificial respiration. If breathing difficult, give oxygen.  LIQUID Irritating to the skin. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS: do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN LOW CONCENTRATIONS May be dangerous if it enters water intakes. Fouling to shoreline. Notify local health and wildlife officials. Notify operators of local water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>4</sub>H<sub>5</sub>CN  
2.3 IMO/UN Designation: 3.2/2411  
2.4 DOT ID No.: 2411  
2.5 CAS Registry No.: 109-74-0  
2.6 NAERG Guide No.: 131  
2.7 Standard Industrial Trade Classification: 51484

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles, rubber gloves, self-contained respirator, protective clothing.
- 3.2 **Symptoms Following Exposure:** Dizziness, rapid respirations, headache, drowsiness, drop in blood pressure and pulse, delayed symptoms. May cause cyanosis (blue-grey coloring of skin and lips due to lack of oxygen)
- 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air; if breathing is stopped, give form of artificial respiration other than mouth to mouth; if breathing difficult, give oxygen. EYES: Hold eyelids open and flush with water for 15 minutes. INGESTION: If victim is conscious, have victim induce vomiting; if victim is unconscious, do nothing except keep victim warm. SKIN: Wash affected area with plenty of water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 4; LD<sub>50</sub> = 28 mg/kg (mouse)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 62°F O.C.  
4.2 Flammable Limits in Air: 1.65% (LFL)  
4.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, CO<sub>2</sub>, water.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Toxic cyanide fumes  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 910°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 32.1 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 8.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99 +%  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  
Category Classification  
Health Hazard (Blue)..... 3  
Flammability (Red)..... 3  
Instability (Yellow)..... 0  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 69.10  
9.3 Boiling Point at 1 atm: 244°F = 118°C = 391°K  
9.4 Freezing Point: -171°F = -113°C = 160°K  
9.5 Critical Temperature: 588.2°F = 309°C = 582.2°K  
9.6 Critical Pressure: 549.8 psia = 37.4 atm = 3.9 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.7936 at 20°C  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 2.4  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: 206.8 Btu/lb = 114.9 cal/g = 4.8 x 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -15,975 Btu/lb = - 8,875 cal/g = -372 x 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.4 psia

### NOTES

# BUTYRONITRILE

BNI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	49.540		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	0 20 40 60 80 100 120 140 160 180 200 220	0.037 0.062 0.105 0.176 0.298 0.502 0.847 1.429 2.410 4.065 6.858 11.569		C U R R E N T  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.322 0.331 0.341 0.350 0.359 0.368 0.378 0.387 0.396 0.405 0.414 0.424 0.433 0.442 0.451 0.461 0.470 0.479 0.488 0.498 0.507 0.516 0.525 0.534 0.544

# 2-BUTANONE PEROXIDE

BNP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Butanone, peroxide Butanox M50, M105, LPT Chaloxyd MEKP-ha 1, -la 1 Ethylmethylketone peroxide Ketonox MEKP Methylethylketone peroxide	Liquid	Colorless	Acetone-like odor
Avoid contact with vapors and liquid. Keep people away. Evacuate. Wear self-contained positive pressure breathing apparatus and full protective clothing. Stay upwind; keep out of low areas. Shut off ignition sources. Call fire department. Stop leak if you can do it without risk. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	COMBUSTIBLE. May be ignited by heat, sparks or flames. Container may explode in heat or fire. Runoff to sewer may create fire or explosion hazard. Fire may produce irritating or poisonous gases. Extinguish fires with dry chemical, CO <sub>2</sub> , water spray or alcohol foam. For massive fire in cargo area, use unmanned hose holder or monitor nozzles. If fire can be controlled, cool container with water from unmanned hose holder or monitor nozzles until after fire is out. If this is impossible, withdraw from area and let fire burn.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Vapor extremely irritating. Contact of vapor with eyes may cause blindness. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed or absorbed through skin. IF IN EYES: hold eyelids open, flush with running water for at least 15 minutes. Flush affected areas with plenty of water. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED: keep victim quiet and maintain normal body temperature.		
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. May be harmful if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>CHCHOH-O<sub>2</sub>  
2.3 IMO/UN Designation: 5.2/2550  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 1338-23-4  
2.6 NAERG Guide No.: Not listed.  
2.7 Standard Industrial Trade Classification: 51699

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, chemical safety gloves, heavy rubber gloves, chemical safety goggles, rubber boots, protective clothing.
- 3.2 **Symptoms Following Exposure:** Extremely destructive to tissue of the mucous membranes, upper respiratory tract, eyes, and skin. Symptoms of exposure include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.
- 3.3 **Treatment of Exposure:** EYES: Hold eyelids open, flush with running water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes, flush affected areas with plenty of running water. Wash with soap and water. INGESTION: Call a physician.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 0.2 ppm.  
3.7 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 470 mg/kg (mouse)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 180°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, CO<sub>2</sub>, or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Explosive.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 20.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Contact with other materials may cause explosion.  
5.3 **Stability During Transport:** Currently not available  
5.4 **Neutralizing Agents for Acids and Caustics:** Dry lime, soda ash  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 50 wt. % in dimethyl phthalate  
7.2 **Storage Temperature:** Refrigerate  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Vent periodically  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** U160  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 176.22  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.170 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 6.08 (est)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2-BUTANONE PEROXIDE

BNP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.297 0.307 0.317 0.327 0.337 0.347 0.357 0.367 0.377 0.387 0.397 0.407 0.417 0.427 0.436 0.446 0.456 0.466 0.476 0.486 0.496 0.506 0.516 0.526 0.536

# BARIUM NITRATE

BNT

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid White Odorless

Sinks and mixes with water.

Restrict access.  
AVOID CONTACT WITH SOLID AND DUST.  
Wear goggles and self-contained breathing apparatus.  
Shut off ignition sources and call fire department.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
May cause fire on contact with combustibles.  
POISONOUS GASES MAY BE PRODUCED IN FIRE.  
Floor discharge area with water.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
POISONOUS IF INHALED.  
Irritating to eyes, nose and throat.  
Move victim to fresh air.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing is difficult, give oxygen.

SOLID  
POISONOUS IF SWALLOWED.  
Irritating to skin and eyes.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Dangerous to aquatic life in high concentrations.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Ba(NO<sub>3</sub>)<sub>2</sub>  
2.3 IMO/UN Designation: 5.1/1446  
2.4 DOT ID No.: 1446  
2.5 CAS Registry No.: 10022-31-8  
2.6 NAERG Guide No.: 141  
2.7 Standard Industrial Trade Classification: 52359

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; dust respirator; rubber gloves and shoes; suitable coveralls.
- 3.2 **Symptoms Following Exposure:** Inhalation or contact with eyes or skin causes irritation. Ingestion causes excessive salivation, vomiting, colic, diarrhea, convulsive tremors, slow, hard pulse, elevated blood pressure. Hemorrhages may occur in the stomach, intestines, and kidneys. Muscular paralysis may follow.
- 3.3 **Treatment of Exposure:** Get medical attention. Alert doctor to possibility of barium poisoning, particularly if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with water for at least 15 min. SKIN: flush with water. INGESTION: oral administration of an aqueous 10% solution of magnesium or sodium sulfate; in severe intoxication, calcium or a magnesium salt may have to be given I.V. with caution; treatment otherwise is supportive and symptomatic.
- 3.4 **TLV-TWA:** 0.5 mg/m<sup>3</sup> as barium.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral rat LD<sub>50</sub> = 355 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Barium poisoning
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 50 mg/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 0.5 mg/m<sup>3</sup> as barium.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable (but see 7.2)
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Yields toxic gaseous oxides of nitrogen when involved in fire.
- 4.6 **Behavior in Fire:** Mixtures with combustible materials are readily ignited and may burn fiercely. Containers may explode.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Contact with combustible material may cause fire.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
500 ppm/1658 hr/stickle back/average survival/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; Reagent
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0 1            |
| Flammability (Red).....   | 0 0            |
| Instability (Yellow)..... | 0 0            |
| Special (White).....      | OX OX          |

- \* First column refers to non-fire situation.
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 261.35
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** 1,098°F = 592°C = 865°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 3.24 at 23°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 36 Btu/lb = 20 cal/g = 0.84 X 10<sup>3</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 22.6 cal/g (est)
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# BARIUM NITRATE

BNT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	5.322		N		N		N
36	5.644		O		O		O
38	5.966		T		T		T
40	6.288						
42	6.610		P		P		P
44	6.933		E		E		E
46	7.255		R		R		R
48	7.577		T		T		T
50	7.899		I		I		I
52	8.222		N		N		N
54	8.544		E		E		E
56	8.866		N		N		N
58	9.188		E		E		E
60	9.510		N		N		N
62	9.833		T		T		T
64	10.150						
66	10.480						
68	10.800						
70	11.120						
72	11.440						
74	11.770						
76	12.090						
78	12.410						
80	12.730						
82	13.050						
84	13.380						

# BENZENE

BNZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzol Benzole	Watery liquid      Colorless      Gasoline-like odor  Floats on water. Flammable, irritating vapor is produced. Freezing point is 42°F.
Restrict access. Avoid contact with liquid and vapor. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 32; Aromatic Hydrocarbon  
2.2 Formula:  $C_6H_6$   
2.3 IMO/UN Designation: 3.2/1114  
2.4 DOT ID No.: 1114  
2.5 CAS Registry No.: 71-43-2  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51122

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self contained positive pressure breathing apparatus; protective gloves and clothing.  
3.2 **Symptoms Following Exposure:** Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction, nausea, and vomiting. Coma and possible death.  
3.3 **Treatment of Exposure:** SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin. EYES: flush with plenty of water until irritation subsides. INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.  
3.4 **TLV-TWA:** 0.5 ppm  
3.5 **TLV-STEL:** 2.5 ppm  
3.6 **TLV-Ceiling:** Not listed  
3.7 **Toxicity by Ingestion:** Grade 3;  $LD_{50}$  = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Leukemia.  
3.10 **Vapor (Gas) Irritant Characteristics:** If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 4.68 ppm  
3.13 **IDLH Value:** 500 ppm  
3.14 **OSHA PEL-TWA:** 1 ppm.  
3.15 **OSHA PEL-STEL:** 5 ppm  
3.16 **OSHA PEL-Ceiling:** Not listed  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 12°F C.C.  
4.2 **Flammable Limits in Air:** 1.3%-7.9%  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent.  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 1097°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 6.0 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Not pertinent.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
5 ppm/6 hr/minnow/lethal/distilled water  
20 ppm/24 hr/sunfish/TLW/tap water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 1.2 lb/lb, 10 days  
6.4 **Food Chain Concentration Potential:** None.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Industrial pure – 99+%; Thiophene-free – 99+%; Nitration – 99+%; Industrial – 90% - 85+%; Reagent – 99+%  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Pressure-vacuum.  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** U019  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 78.11  
9.3 **Boiling Point at 1 atm:** 176°F = 80.1°C = 353.3°K  
9.4 **Freezing Point:** 42.0°F = 5.5°C = 278.7°K  
9.5 **Critical Temperature:** 552.0°F = 288.9°C = 562.1°K  
9.6 **Critical Pressure:** 710 psia = 48.3 atm = 4.89 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.879 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 28.9 dynes/cm = 0.0289 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 35.0 dynes/cm = 0.035 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 2.8  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.061  
9.12 **Latent Heat of Vaporization:** 169 Btu/lb = 94.1 cal/g =  $3.94 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** –17,460 Btu/lb = –9698 cal/g =  $-406.0 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent.  
9.15 **Heat of Solution:** Not pertinent.  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** 30.45 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 3.22 psia

### NOTES

# BENZENE

BNZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
55	55.330	45	0.394	75	0.988	55	0.724
60	55.140	50	0.396	80	0.981	60	0.693
65	54.960	55	0.398	85	0.975	65	0.665
70	54.770	60	0.400	90	0.969	70	0.638
75	54.580	65	0.403	95	0.962	75	0.612
80	54.400	70	0.405	100	0.956	80	0.588
85	54.210	75	0.407	105	0.950	85	0.566
90	54.030	80	0.409	110	0.944	90	0.544
95	53.840	85	0.411	115	0.937	95	0.524
100	53.660	90	0.414	120	0.931	100	0.505
105	53.470	95	0.416	125	0.925	105	0.487
110	53.290	100	0.418	130	0.919	110	0.470
115	53.100			135	0.912	115	0.453
120	52.920			140	0.906	120	0.438
125	52.730			145	0.900		
130	52.540			150	0.893		
135	52.360			155	0.887		
140	52.170			160	0.881		
145	51.990			165	0.875		
150	51.800			170	0.868		
155	51.620						
160	51.430						
165	51.250						
170	51.060						
175	50.870						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.180	50	0.881	50	0.01258	0	0.204
		60	1.171	60	0.01639	25	0.219
		70	1.535	70	0.02109	50	0.234
		80	1.989	80	0.02681	75	0.248
		90	2.547	90	0.03371	100	0.261
		100	3.227	100	0.04196	125	0.275
		110	4.049	110	0.05172	150	0.288
		120	5.033	120	0.06317	175	0.301
		130	6.201	130	0.07652	200	0.313
		140	7.577	140	0.09194	225	0.325
		150	9.187	150	0.10960	250	0.337
		160	11.060	160	0.12980	275	0.349
		170	13.220	170	0.15270	300	0.360
		180	15.700	180	0.17850	325	0.371
		190	18.520	190	0.20750	350	0.381
		200	21.740	200	0.23970	375	0.392
		210	25.360	210	0.27560	400	0.402
						425	0.412
						450	0.421
						475	0.431
						500	0.440
						525	0.449
						550	0.457
						575	0.465
						600	0.474

# BISMUTH OXYCHLORIDE

BOC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Basic bismuth choride Bismuth chloride oxide Bismuth subchloride Bismuthyl chloride Pearl white	Solid  White  Odorless   Sinks in water.
Stop discharge if possible. Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. Irritating gases may be produced when heated. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: BiOCl
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 7787-59-9
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; protective gloves; dust mask
- 3.2 Symptoms Following Exposure: Contact with dust causes mild eye irritation and can cause skin rashes.
- 3.3 Treatment of Exposure: EYES: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 0; LD<sub>50</sub> > 21.5 g/kg (rat)
- 3.8 Toxicity by Inhalation: May cause irritation to mucous membranes.
- 3.9 Chronic Toxicity: May cause black spots on gums, foul breath, and salivation.
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Irritating hydrogen chloride gas may form in fire.
- 4.6 Behavior in Fire: Emits toxic fumes of chloride ion and bismuth when heated to decomposition.
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Dry powder, 100%; aqueous concentrates; dispersions of solid in mineral oil or castor oil.
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 260.4
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 7.7 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# BISMUTH OXYCHLORIDE

BOC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BISPHENOL A

BPA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> p,p'- Dihydroxydiphenyldimethylmeth- ane 2,2-Bis(4- Hydroxyphenyl)propane 4,4'-Isopropylidendiphenol Ucar bisphenol HP	Solid flakes or powder    White to light brown    Weak medicine odor  Sinks in water.
<b>Keep people away. Avoid contact with solid and dust. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to nose and throat if inhaled. Move to fresh air.  SOLID Irritating to skin and eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVUL- SIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $p\text{-HOC}_6\text{H}_4\text{C}(\text{CH}_3)_2\text{C}_6\text{H}_4\text{OH-p}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 80-05-7
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification:  
51243

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved dust mask and clean, body-covering clothing sufficient to prevent excessive or repeated exposure to dust, fumes, or solutions. Safety glasses with side shields.
- 3.2 **Symptoms Following Exposure:** Dusts irritating to upper respiratory passages; may cause sneezing.
- 3.3 **Treatment of Exposure:** SKIN: Wash with soap and plenty of water. Avoid wearing contaminated clothing; EYES: Promptly flush with plenty of water for at least 15 minutes and get medical help. INGESTION: If large amounts are swallowed, induce vomiting promptly and get medical help promptly. No known antidote.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to  $5 \text{ g/kg}$  (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Lowered hemoglobin and erythrocyte (red blood cell) counts below normal in rats.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 415°F O.C.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 85.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 23.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; high purity
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 228.28
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** 315°F = 157°C = 430°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.195 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BISPHENOL A

BPA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.060		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BARIUM PERCHLORATE

BPC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Barium perchlorate trihydrate	Solid  White  Odorless   Sinks and mixes with water.
<b>Restrict access.</b> <b>Shut off ignition sources and call fire department.</b> <b>Evacuate.</b> <b>AVOID CONTACT WITH SOLID AND DUST.</b> <b>Wear rubber overclothing (including gloves).</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable. May explode on contact with combustibles. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Containers may explode in fire. Combat fires from safe distance or protected location. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: Ba(ClO<sub>4</sub>)<sub>2</sub>·3H<sub>2</sub>O
- 2.3 IMO/UN Designation: 5.1/1447
- 2.4 DOT ID No.: 1447
- 2.5 CAS Registry No.: 10294-39-0
- 2.6 NAERG Guide No.: 141
- 2.7 Standard Industrial Trade Classification: 52339

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; dust respirator; rubber gloves and shoes; suitable coveralls.
- 3.2 **Symptoms Following Exposure:** Inhalation or contact with eyes or skin causes irritation. Ingestion causes excessive salivation, vomiting, colic, diarrhea, convulsive tremors, slow, hard pulse, and elevated blood pressure; hemorrhages may occur in the stomach, intestines, and kidneys; muscular paralysis may follow.
- 3.3 **Treatment of Exposure:** Get medical attention. Alert doctor to possibility of barium poisoning, particularly if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with water for at least 15 min. SKIN: flush with water. INGESTION: oral administration of an aqueous 10% solution of magnesium or sodium sulfate; for severe intoxication, calcium or a magnesium salt may have to be given I.V. with caution; treatment otherwise is supportive and symptomatic.
- 3.4 **TLV-TWA:** 0.5 mg/m<sup>3</sup> as barium.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Barium poisoning
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 50 mg/m<sup>3</sup> as barium
- 3.14 **OSHA PEL-TWA:** 0.5 mg/m<sup>3</sup> as barium.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable (but see 7.2)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Increases the intensity of fire. Containers may explode.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
When mixed with combustible material or finely divided metals, can cause explosions.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: -  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; Reagent
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 390.35
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** 941°F = 505°C = 778°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 3.2 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 9 Btu/lb = 5 cal/g = 0.2 X 10<sup>3</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# BARIUM PERCHLORATE

BPC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
32	200.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BENZENE PHOSPHORUS DICHLORIDE

BPD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dichlorophenylphosphine Phenylphosphine dichloride Phenylphosphonous dichloride Phenylphosphorus dichloride	Liquid  Colorless  Unpleasant odor  Reacts violently with water. Poisonous visible vapor cloud is produced.
<b>Restrict access.</b> <b>Evacuate.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID. GAS PRODUCED IN REACTION WITH WATER. POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** C<sub>6</sub>H<sub>5</sub>PCl<sub>2</sub>  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** 2798  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 137  
2.7 **Standard Industrial Trade Classification:** 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; acid-type canister mask; goggles and face shield; rubber gloves; protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat; pulmonary edema may develop following severe exposures. Contact with skin or eyes causes severe burns. Ingestion causes severe burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove to fresh air; if breathing has stopped, start mouth-to-mouth resuscitation. EYES: flush with water for at least 15 min.; do not use oils or ointments. SKIN: flush with water; wash with soap and water. INGESTION: give large amounts of milk or water; do NOT induce vomiting; if vomiting does occur, give milk or beaten eggs at one-hour intervals.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 215°F O.C.  
May be lower because of presence of dissolved phosphorus.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Large amounts of water.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic fumes include oxides of phosphorus and hydrogen chloride.
- 4.6 **Behavior in Fire:** Containers may rupture. Hot liquid is spontaneously flammable because of presence of dissolved phosphorus.
- 4.7 **Auto Ignition Temperature:** 319°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously to form hydrogen chloride (hydrochloric acid).
- 5.2 **Reactivity with Common Materials:** Corrodes metal, except 316 stainless steel, nickel, or Hastelloy.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 179.0
- 9.3 **Boiling Point at 1 atm:** 430°F = 221°C = 494°K
- 9.4 **Freezing Point:** -60°F = -51°C = 222°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.140 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -8,200 Btu/lb = -4,500 cal/g = -190 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -72 Btu/lb = -40 cal/g = -1.7 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BENZENE PHOSPHORUS DICHLORIDE

BPD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
32	72.540	34	0.431	34	1.048	52	5.463
34	72.469	36	0.432	36	1.048	54	5.368
36	72.400	38	0.433	38	1.048	56	5.275
38	72.330	40	0.434	40	1.048	58	5.185
40	72.259	42	0.436	42	1.048	60	5.097
42	72.190	44	0.437	44	1.048	62	5.011
44	72.120	46	0.438	46	1.048	64	4.927
46	72.049	48	0.439	48	1.048	66	4.845
48	71.980	50	0.440	50	1.048	68	4.765
50	71.910	52	0.441	52	1.048	70	4.688
52	71.839	54	0.442	54	1.048	72	4.611
54	71.770	56	0.443	56	1.048	74	4.537
56	71.709	58	0.444	58	1.048	76	4.465
58	71.639	60	0.446	60	1.048	78	4.394
60	71.570	62	0.447	62	1.048	80	4.325
62	71.500	64	0.448	64	1.048	82	4.257
64	71.429	66	0.449	66	1.048	84	4.191
66	71.360	68	0.450	68	1.048	86	4.126
68	71.290	70	0.451	70	1.048		
70	71.219	72	0.452	72	1.048		
72	71.150	74	0.453	74	1.048		
74	71.080	76	0.454	76	1.048		
76	71.009						
78	70.940						
80	70.870						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	150	0.025	150	0.00068		N
	E	160	0.035	160	0.00093		O
	A	170	0.048	170	0.00126		T
	C	180	0.065	180	0.00168		
	T	190	0.087	190	0.00223		P
	S	200	0.116	200	0.00293		E
		210	0.153	210	0.00382		R
		220	0.201	220	0.00494		T
		230	0.262	230	0.00634		I
		240	0.339	240	0.00807		N
		250	0.434	250	0.01021		E
		260	0.553	260	0.01282		N
		270	0.700	270	0.01600		T
		280	0.880	280	0.01985		
		290	1.100	290	0.02447		
		300	1.367	300	0.03001		
		310	1.689	310	0.03659		
		320	2.075	320	0.04438		
		330	2.536	330	0.05356		
		340	3.085	340	0.06432		
		350	3.733	350	0.07689		
		360	4.498	360	0.09150		
		370	5.394	370	0.10840		
		380	6.441	380	0.12790		
		390	7.659	390	0.15030		
		400	9.071	400	0.17600		

# 2-BROMOPENTANE

BPE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Pentylbromide		Liquid	Colorless
		Sinks in water.	
Avoid contact with liquid and vapor. Keep people away. Wear self-contained breathing apparatus and full protective clothing. Shut off sources of ignition. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE. Flashback may occur along vapor trail. Containers may explode in fire. Emits toxic fumes in fire. Forms explosive mixtures in air in fire. Water may be ineffective against fire. Wear self-contained breathing apparatus and full protective clothing. Extinguish with CO <sub>2</sub> , dry chemicals, or foam.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be harmful if inhaled or absorbed through the skin. Irritating to the eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID May be harmful if swallowed or absorbed through the skin. Irritating to the eyes and skin. IF IN EYES: flush with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF SWALLOWED: do nothing except keep victim warm.		
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: CH<sub>3</sub>CHBr(C<sub>2</sub>H<sub>5</sub>)CH<sub>3</sub>
- 2.3 IMO/UN Designation: 3.2/2343
- 2.4 DOT ID No.: 2343
- 2.5 CAS Registry No.: 107-81-3
- 2.6 NAERG Guide No.: 130
- 2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, safety goggles, chemical-resistant gloves, other protective clothing.
- 3.2 **Symptoms Following Exposure:** Irritating to eyes, nose, throat, and upper respiratory tract. Causes skin irritation.
- 3.3 **Treatment of Exposure:** Call a physician. EYES: Flush with plenty of water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes, flush affected areas with water for at least 15 minutes. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Do nothing except keep victim warm.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 150 mg/kg (mouse, ipr)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Liver damage
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 69°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** CO<sub>2</sub>, dry chemicals, foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective against fire.
- 4.5 **Special Hazards of Combustion Products:** Toxic fumes of Br
- 4.6 **Behavior in Fire:** May form explosive mixtures with air in fire.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: (2)
  - Human Oral hazard: (2)
  - Human Contact hazard: -
  - Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** None
- 7.4 **Venting:** None
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 151.07
- 9.3 **Boiling Point at 1 atm:** 243°F = 117°C = 390°K
- 9.4 **Freezing Point:** -140°F = -95.5°C = 177.7°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.208 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2-BROMOPENTANE

BPE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	75.380		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.195 0.202 0.208 0.215 0.221 0.228 0.235 0.241 0.248 0.254 0.261 0.268 0.274 0.281 0.287 0.294 0.300 0.307 0.314 0.320 0.327 0.333 0.340 0.347 0.353

# BROMINE PENTAFLUORIDE

BPF

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquefied gas      Colorless      Irritating odor

Reacts violently with water. Poisonous vapor is produced.

Restrict access.  
Evacuate.  
Avoid contact with liquid and vapor.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
May cause fire on contact with combustibles.  
Will increase the intensity of a fire.  
**POISONOUS GASES MAY BE PRODUCED IN FIRE.**  
Containers may explode in fire.  
Wear goggles and self-contained breathing apparatus.  
**DO NOT USE WATER OR FOAM ON FIRE.**

### Exposure

CALL FOR MEDICAL AID.

**VAPOR**  
Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

**LIQUID**  
Will burn skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material  
Do not burn

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: BrF<sub>5</sub>  
2.3 IMO/UN Designation: 8/1745  
2.4 DOT ID No.: 1745  
2.5 CAS Registry No.: 7789-30-2  
2.6 NAERG Guide No.: 144  
2.7 Standard Industrial Trade Classification: 52241

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, acid suit, and gloves  
3.2 **Symptoms Following Exposure:** Chemical is highly corrosive and toxic. Inhalation causes severe burns of mucous membrane. Ingestion causes severe burns of mouth. Contact with eyes or skin causes severe burns.  
3.3 **Treatment of Exposure:** Get medical attention IMMEDIATELY for any exposure to this chemical, even if no adverse effects are evident. **INHALATION:** remove victim from area; apply artificial respiration if breathing has ceased. **INGESTION:** give large amount of water. **EYES:** wash with copious amounts of water for 15 min. **SKIN:** wash with large amounts of water and follow with lime water; remove contaminated clothing.  
3.4 **TLV-TWA:** 0.1 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable. Chemical is strong oxidizer and may cause fire in contact with organic materials such as wood, cotton, or straw.  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water or foam on adjacent fires.  
4.5 **Special Hazards of Combustion Products:** Toxic and irritating fumes of hydrogen fluoride and bromine may form in fires.  
4.6 **Behavior in Fire:** Containers may burst when exposed to heat of fire.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently with water, evolving hydrogen fluoride, an extremely irritating and corrosive gas.  
5.2 **Reactivity with Common Materials:** Reacts violently with many metals and materials of construction such as wood, glass, some plastics.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (3)  
Human Oral hazard: (3)  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 98.0+%; Pure, 99.9%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Padded  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer  
8.2 **49 CFR Class:** 5.1  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	0
Instability (Yellow).....	3
Special (White).....	W OX

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 174.9  
9.3 **Boiling Point at 1 atm:** 106°F = 41°C = 314°K  
9.4 **Freezing Point:** -76°F = -60°C = 213°K  
9.5 **Critical Temperature:** 386.6°F = 197°C = 470.2°K  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 2.48 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 6.03  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.089 at 25°C  
9.12 **Latent Heat of Vaporization:** 76.8 Btu/lb = 42.7 cal/g = 1.79 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 7.07 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# BROMINE PENTAFLUORIDE

BPF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
45	157.599		N O T		N O T		N O T
50	157.000						
55	156.400						
60	155.799						
65	155.199		P		P		P
70	154.599		E		E		E
75	154.000		R		R		R
80	153.400		T		T		T
85	152.801		I		I		I
90	152.199		N		N		N
95	151.599		E		E		E
100	151.000		N		N		N
105	150.400		T		T		T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	45	3.542	45	0.11430		N
	E	50	4.039	50	0.12910		O
	A	55	4.593	55	0.14540		T
	C	60	5.212	60	0.16340		
	T	65	5.899	65	0.18320		P
	S	70	6.661	70	0.20490		E
		75	7.504	75	0.22870		R
		80	8.436	80	0.25470		T
		85	9.463	85	0.28310		I
		90	10.590	90	0.31400		N
		95	11.830	95	0.34760		E
		100	13.190	100	0.38410		N
		105	14.680	105	0.42360		E
		110	16.300	110	0.46630		N
		115	18.080	115	0.51250		T
		120	20.000	120	0.56230		
		125	22.100	125	0.61590		
		130	24.370	130	0.67350		
		135	26.840	135	0.73530		
		140	29.500	140	0.80160		
		145	32.380	145	0.87250		
		150	35.490	150	0.94840		
		155	38.830	155	1.02900		

# BUTYL BENZYL PHTHALATE

BPH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzyl n-butyl phthalate Phthalic acid, benzyl butyl ether	Liquid	Colorless	Slight odor
Sinks in water.			
Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Irritating gases may be produced when heated. Extinguish with dry chemicals , alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 4; Esters
- 2.2 Formula:  $C_{16}H_{22}O_4$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 85-68-7
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Protective gloves and goggles
- 3.2 Symptoms Following Exposure: Prolonged contact with liquid causes some irritation of eyes and skin.
- 3.3 Treatment of Exposure: EYES: flush with water for 15 min. SKIN: wash well with soap and water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 1; oral rat  $LD_{50}$  = 13,500 mg/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat.
- 3.11 Liquid or Solid Characteristics: No appreciable hazard; practically harmless to skin.
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 390°F O.C.
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, foam
- 4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.
- 4.5 Special Hazards of Combustion Products: Irritating vapors of unburned chemical may form in fires.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 105.9 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 29.5 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: A
- 7.6 Ship Type: 2
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: 100 pounds
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 313
- 9.3 Boiling Point at 1 atm: 698°F = 380°C = 643°K
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.12 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: -14,550 Btu/lb = -8,090 cal/g = -338 X 10<sup>3</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Low

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:

Bioaccumulation: Z
Damage to living resources: 4
Human Oral hazard: 1
Human Contact hazard: 0
Reduction of amenities: X

NOTES



# BUTYL BENZYL PHTHALATE

BPH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	70.469	51	0.500	51	1.048	70	24.590
54	70.400	52	0.500	52	1.048	75	22.160
56	70.330	53	0.500	53	1.048	80	20.020
58	70.259	54	0.500	54	1.048	85	18.120
60	70.190	55	0.500	55	1.048	90	16.420
62	70.120	56	0.500	56	1.048	95	14.910
64	70.049	57	0.500	57	1.048	100	13.570
66	69.980	58	0.500	58	1.048	105	12.360
68	69.910	59	0.500	59	1.048	110	11.280
70	69.839	60	0.500	60	1.048	115	10.320
72	69.770	61	0.500	61	1.048	120	9.445
74	69.700	62	0.500	62	1.048	125	8.661
76	69.639	63	0.500	63	1.048	130	7.953
78	69.570	64	0.500	64	1.048	135	7.314
80	69.500	65	0.500	65	1.048	140	6.736
82	69.429	66	0.500	66	1.048	145	6.211
84	69.360	67	0.500	67	1.048	150	5.736
86	69.290	68	0.500	68	1.048	155	5.303
		69	0.500	69	1.048	160	4.910
		70	0.500	70	1.048	165	4.551
		71	0.500	71	1.048	170	4.223
		72	0.500	72	1.048	175	3.924
		73	0.500	73	1.048	180	3.650
		74	0.500	74	1.048	185	3.399
		75	0.500	75	1.048	190	3.169
		76	0.500	76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
86	0.000	320	0.005	320	0.00020		C
		340	0.010	340	0.00037		U
		360	0.018	360	0.00063		R
		380	0.031	380	0.00107		R
		400	0.052	400	0.00176		E
		420	0.085	420	0.00282		N
		440	0.137	440	0.00444		T
		460	0.216	460	0.00685		L
		480	0.334	480	0.01037		Y
		500	0.507	500	0.01542		
		520	0.757	520	0.02254		N
		540	1.113	540	0.03245		O
		560	1.610	560	0.04603		T
		580	2.296	580	0.06440		
		600	3.232	600	0.08893		A
		620	4.491	620	0.12130		V
		640	6.167	640	0.16350		A
		660	8.373	660	0.21810		I
		680	11.250	680	0.28780		L
							A
							B
							L
							E

# BARIUM PERMANGANATE

BPM

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid Dark purple to black Odorless

Sinks and mixes with water.

Restrict access.  
Shut off ignition sources and call fire department.  
**AVOID CONTACT WITH SOLID AND DUST.**  
Wear rubber overclothing (including gloves).  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
May cause fire on contact with combustibles.  
Containers may explode in fire.  
Combat fires from safe distance or protected location.  
Flood discharge area with water.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
POISONOUS IF INHALED.  
Irritating to eyes, nose and throat.  
Move victim to fresh air.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing is difficult, give oxygen.

SOLID  
POISONOUS IF SWALLOWED.  
Irritating to skin and eyes.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Ba(MnO<sub>4</sub>)<sub>2</sub>  
2.3 IMO/UN Designation: 5.1/1448  
2.4 DOT ID No.: 1448  
2.5 CAS Registry No.: 7787-36-2  
2.6 NAERG Guide No.: 141  
2.7 Standard Industrial Trade Classification: 52499

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; dust respirator; rubber gloves and shoes.
- 3.2 **Symptoms Following Exposure:** Inhalation or contact with eyes or skin causes irritation. Ingestion causes abdominal pain, nausea, vomiting, pallor, shortness of breath.
- 3.3 **Treatment of Exposure:** Get medical attention. Alert doctor to possibility of barium poisoning, particularly if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with copious amounts of water for 15 min. SKIN: wash with copious amounts of water. INGESTION: induce vomiting; give a 10% water solution of Epsom salt.
- 3.4 **TLV-TWA:** 0.5 mg/m<sup>3</sup> as barium.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Barium poisoning
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 50 mg/m<sup>3</sup> as barium.
- 3.14 **OSHA PEL-TWA:** 0.5 mg/m<sup>3</sup> as barium.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Can increase the intensity of fire.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
When mixed with combustible material, can ignite by friction or acids; may be spontaneously combustible.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
2.2 to 4.1 mg/l of Mn/8 to 18 hr/fish/killed\*  
\*Type of water not specified.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 375
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 3.77 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# BARIUM PERMANGANATE

BPM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	55.490		N		N		N
36	56.280		O		O		O
38	57.060		T		T		T
40	57.850						
42	58.640		P		P		P
44	59.430		E		E		E
46	60.220		R		R		R
48	61.010		T		T		T
50	61.800		I		I		I
52	62.590		N		N		N
54	63.380		E		E		E
56	64.160		N		N		N
58	64.950		E		E		E
60	65.740		N		N		N
62	66.530		T		T		T
64	67.320						
66	68.110						
68	68.900						
70	69.690						
72	70.480						
74	71.259						
76	72.049						
78	72.839						
80	73.629						
82	74.419						
84	75.209						

# N-BUTYL PROPIONATE

**BPN**

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Propanoic acid butyl ester Propionic acid butyl ester	Liquid  Colorless to straw yellow
Wear full impervious protective clothing and approved respirator. Avoid contact with liquid and vapor. Remove all ignition sources. Call the fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Wear full chemical protective clothing and self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush skin with water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{CH}_2\text{COO}(\text{CH}_2)_3\text{CH}_3$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: 1914  
2.5 CAS Registry No.: 590-012  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear full impervious protective clothing and approved respirator. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Contact will cause eye and skin irritation. Vapor exposure may cause eye and respiratory tract irritation.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 101°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, alcohol foam or carbon dioxide.  
4.4 Fire Extinguishing Agents Not to Be Used: Water.  
4.5 Special Hazards of Combustion Products: Irritating and toxic gases, such as carbon dioxide and carbon monoxide, may be produced in fire.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 45.2 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 14.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.  
5.5 Polymerization: Will not polymerize.  
5.6 Inhibitor of Polymerization: Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: T  
Damage to living resources: 2  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99%; varying concentrations available.  
7.2 Storage Temperature: Ambient.  
7.3 Inert Atmosphere: No requirement.  
7.4 Venting: Not listed.  
7.5 IMO Pollution Category: C  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable Liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 130.19  
9.3 Boiling Point at 1 atm: 296.2°F = 146.8°C = 419.8°K  
9.4 Freezing Point: -128KF = -89°C = 184°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 0.8754  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Currently not available  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent.  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# N-BUTYL PROPIONATE

BPN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	7.310		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# BARIUM PEROXIDE

BPO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Barium binoxide Barium dioxide Barium superoxide	Solid  Light gray to tan  Odorless  Sinks in water.
<b>Restrict access.</b> Shut off ignition sources and call fire department. <b>AVOID CONTACT WITH SOLID AND DUST.</b> Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. Containers may explode in fire. Combat fires from safe distance or protected location. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: BaO <sub>2</sub> 2.3 IMO/UN Designation: 5.1/1449 2.4 DOT ID No.: 1449 2.5 CAS Registry No.: 1304-29-6 2.6 NAERG Guide No.: 141 2.7 Standard Industrial Trade Classification: 52265
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> U.S.B.M. -approved toxic dust respirator; liquid-proof PVC gloves; chemical safety goggles; full cover clothing. 3.2 <b>Symptoms Following Exposure:</b> Inhalation causes irritation of mucous membranes, throat, and nose. Contact with eyes or skin causes severe burns. Ingestion causes excessive salivation, vomiting, colic, diarrhea, convulsive tremors, slow, hard pulse, and elevated blood pressure; hemorrhages may occur in the stomach, intestines, and kidneys; muscular paralysis may follow. 3.3 <b>Treatment of Exposure:</b> Get medical attention. Alert doctor to possibility of barium poisoning, particularly if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: oral administration of an aqueous 10% solution of magnesium or sodium sulfate; in a severe intoxication, calcium or a magnesium salt may have to be given I.V. with caution; treatment otherwise is supportive and symptomatic. 3.4 <b>TLV-TWA:</b> 0.5 mg/m <sup>3</sup> as barium 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Currently not available 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Barium poisoning 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Odorless 3.13 <b>IDLH Value:</b> 50 mg/m <sup>3</sup> as barium. 3.14 <b>OSHA PEL-TWA:</b> 0.5 mg/m <sup>3</sup> as barium. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable but may cause fire on contact with combustibles.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Flood with water, dry powder (e.g. graphite, powdered limestone).
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Can increase intensity of fire.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Decomposes slowly. The reaction is not hazardous.
- 5.2 **Reactivity with Common Materials:**  
Corrodes metal slowly. If mixed with combustible material or finely divided metals, can ignite spontaneously or by friction.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: (3)  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 91-92.5% high-purity reagent
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
| Special (White).....      | OX             |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 169.4
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** 842°F = 450°C = 723°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 4.96 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** -194 Btu/lb = -108 cal/g = -4.52 X 10<sup>5</sup> J/kg
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# BARIUM PEROXIDE

BPO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
32	1.500		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 1-BROMOPROPANE

**BPR**

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Propylbromide n-Propylbromide	Liquid	Colorless
Sinks in water.		
Avoid contact with liquid and vapor. Keep people away. Wear self-contained breathing apparatus and full protective clothing. Shut off all sources of ignition. Call fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	FLAMMABLE. Flashback may occur along vapor trail. Containers may explode under fire conditions. Emits toxic fumes under fire conditions. Forms explosive mixtures in air. Water may be ineffective against fire. Wear self-contained breathing apparatus and full protective clothing. Extinguish with CO <sub>2</sub> , dry chemicals, or foam. Use water streams to cool exposed containers until well after the fire is out.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to the eyes, nose, and throat. May be harmful if inhaled or absorbed through the skin. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to the skin and eyes. May be harmful if swallowed or absorbed through the skin. IF IN EYES: flush with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF SWALLOWED: do nothing except keep victim warm.	
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>3</sub> H <sub>7</sub> Br 2.3 IMO/UN Designation: 3.2 + 3.3/2344 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 106-94-5 2.6 NAERG Guide No.: Not listed. 2.7 Standard Industrial Trade Classification: 51139
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Approved respirator, rubber gloves, chemical safety goggles, other protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Irritating to the eyes, nose, throat, upper respiratory tract, and skin. 3.3 <b>Treatment of Exposure:</b> Call a physician. EYES: Flush with running water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes, flush affected areas with water for at least 15 minutes. INHALATION: Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Do nothing except keep victim warm. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 2.95 g/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 78°F C.C.  
4.2 **Flammable Limits in Air:** 4.6% LEL  
4.3 **Fire Extinguishing Agents:** Foam, CO<sub>2</sub>, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective against fire.  
4.5 **Special Hazards of Combustion Products:** Toxic fumes of Hydrogen Bromide  
4.6 **Behavior in Fire:** 914°F  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: 0  
Human Contact hazard: -  
Reduction of amenities: -

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** None  
7.4 **Venting:** None  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 123.01  
9.3 **Boiling Point at 1 atm:** 160°F = 70.9°C = 344°K  
9.4 **Freezing Point:** -166°F = -110°C = 163°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.3537 at 20°C  
9.8 **Liquid Surface Tension:** 25.9 dyne/cm = 0.026 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.34  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** -7276 Btu/lb = -4042 cal/g = 169 x 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 5.3 psia

## NOTES



# 1-BROMOPROPANE

BPR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	84.510		C U R R E N T L Y  N O T  A V A I L A B L E	53	0.746	35 40 45 50 55 60 65 70 75 80 85 90 95 100	0.635 0.614 0.595 0.577 0.559 0.543 0.528 0.513 0.500 0.487 0.475 0.463 0.452 0.441

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.320	-60 -40 -20 0 20 40 60 80 100 120 140	0.016 0.031 0.060 0.116 0.225 0.435 0.843 1.632 3.161 6.122 11.857		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.162 0.167 0.172 0.177 0.181 0.186 0.191 0.195 0.200 0.205 0.210 0.214 0.219 0.224 0.229 0.233 0.238 0.243 0.247 0.252 0.257 0.262 0.266 0.271 0.276

# BENZENE PHOSPHORUS THIODICHLORIDE

BPT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzenethiophosphoryl chloride Phenylphosphine thiodichloride Phenylphosphonothioic dichloride	Liquid  Colorless  Unpleasant odor  Sinks and reacts in water. Poisonous visible vapor cloud is produced.
Restrict access. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR PRODUCED IN REACTION WITH WATER. POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump  
Chemical and Physical Treatment:  
Neutralize  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_6H_5PSCl_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2799  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 137  
2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; acid-type canister mask; goggles and face shield; rubber gloves; protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation of vapor irritates nose and throat; pulmonary edema may result. Contact with eyes or skin causes severe irritation. Ingestion causes severe irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove to fresh air. EYES: flush with water for at least 15 min.; do not use oils or ointments. SKIN: flush with water; wash with soap and water. INGESTION: give large amounts of water or milk; induce vomiting; give milk, eggs, or olive oil.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 252°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic fumes include oxides of phosphorus and sulfur and hydrogen chloride.  
4.6 **Behavior in Fire:** Containers may rupture.  
4.7 **Auto Ignition Temperature:** 338°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Forms hydrogen chloride fumes (hydrochloric acid). The reaction is slow unless water is hot.  
5.2 **Reactivity with Common Materials:** Corrodes metal slowly.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 211  
9.3 Boiling Point at 1 atm: 518°F = 270°C = 543°K  
9.4 Freezing Point: -11.2°F = -24.0°C = 249.2°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.378 at 20°C (liquid)  
9.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -7,700 Btu/lb = -4,300 cal/g = -180 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>3</sup> J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# BENZENE PHOSPHORUS THIODICHLORIDE

BPT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	88.570	34	0.400	34	1.048	52	5.463
36	88.500	36	0.400	36	1.048	54	5.368
38	88.429	38	0.400	38	1.048	56	5.275
40	88.360	40	0.400	40	1.048	58	5.185
42	88.290	42	0.400	42	1.048	60	5.097
44	88.219	44	0.400	44	1.048	62	5.011
46	88.150	46	0.400	46	1.048	64	4.927
48	88.080	48	0.400	48	1.048	66	4.845
50	88.020	50	0.400	50	1.048	68	4.765
52	87.950	52	0.400	52	1.048	70	4.688
54	87.879	54	0.400	54	1.048	72	4.611
56	87.809	56	0.400	56	1.048	74	4.537
58	87.740	58	0.400	58	1.048	76	4.465
60	87.669	60	0.400	60	1.048	78	4.394
62	87.599	62	0.400	62	1.048	80	4.325
64	87.530	64	0.400	64	1.048	82	4.257
66	87.459	66	0.400	66	1.048	84	4.191
68	87.389	68	0.400	68	1.048	86	4.126
70	87.320						
72	87.250						
74	87.179						
76	87.110						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	220	0.497	220	0.01437		N
	E	230	0.584	230	0.01664		O
	A	240	0.683	240	0.01918		T
	C	250	0.795	250	0.02202		
	T	260	0.921	260	0.02517		P
	S	270	1.064	270	0.02866		E
		280	1.224	280	0.03252		R
		290	1.402	290	0.03676		T
		300	1.601	300	0.04142		I
		310	1.821	310	0.04652		N
		320	2.066	320	0.05208		E
		330	2.335	330	0.05812		N
		340	2.632	340	0.06468		T
		350	2.957	350	0.07178		
		360	3.313	360	0.07945		
		370	3.702	370	0.08771		
		380	4.126	380	0.09658		
		390	4.586	390	0.10610		
		400	5.085	400	0.11630		
		410	5.626	410	0.12710		
		420	6.209	420	0.13870		
		430	6.838	430	0.15110		
		440	7.514	440	0.16420		
		450	8.240	450	0.17800		
		460	9.018	460	0.19270		
		470	9.850	470	0.20830		

# N-BUTYRIC ACID

BRA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butanic acid Butanoic acid Butyric acid Ethylacetic acid Propanecarboxylic acid	Liquid  Colorless  Rancid butter odor  Floats and mixes with water. Freezing point is 23°F.
<b>Restrict access.</b> <b>Avoid contact with liquid and vapor.</b> <b>Wear rubber overclothing (including gloves).</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 4; Organic acids
- 2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2820
- 2.5 CAS Registry No.: 107-92-6
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51375

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; rubber gloves; vapor- proof plastic goggles; impervious apron and boots
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membrane and respiratory tract; may cause nausea and vomiting. Ingestion causes irritation of mouth and stomach. Contact with eyes may cause serious injury. Contact with skin may cause burns; chemical is readily absorbed through the skin and may cause damage by this route.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give oxygen if breathing is difficult; call a physician. INGESTION: give large amount of water and induce vomiting. EYES: irrigate with water for 15 min. and get medical attention. SKIN: flush affected areas immediately and thoroughly with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 2,940 \text{ mg/kg}$  (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** 0.001 ppm
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 166°F O.C. 160°F C.C.
- 4.2 **Flammable Limits in Air:** 2.19%-13.4%
- 4.3 **Fire Extinguishing Agents:** Dry chemical, "alcohol" foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** 842°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 2.7 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 23.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** May attack aluminum or other light metals with formation of flammable hydrogen gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
400 ppm\*/lethal/fresh water  
200 ppm/24 hr/bluegill/TL<sub>50</sub>/fresh water  
\*Time period not specified.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
1,150 lb/lb, 5 days; 1,450 lb/lb, 20 days
- 6.4 **Food Chain Concentration Potential:**  
Seafood may be tainted following a spill but chemical does not concentrate in food chain.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 99.5+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 88.1
- 9.3 **Boiling Point at 1 atm:** 327°F = 164°C = 437°K
- 9.4 **Freezing Point:** 23°F = -5°C = 268°K
- 9.5 **Critical Temperature:** 671.0°F = 355°C = 628.2°K
- 9.6 **Critical Pressure:** 764 psia = 52 atm = 5.3 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.958 at 20°C
- 9.8 **Liquid Surface Tension:** 26.74 dynes/cm = 0.02674 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 3.0
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.079 at 20°C
- 9.12 **Latent Heat of Vaporization:** 167 Btu/lb = 92.7 cal/g =  $3.88 \times 10^5 \text{ J/kg}$
- 9.13 **Heat of Combustion:** -10,620 Btu/lb = -5,900 cal/g =  $-247 \times 10^6 \text{ J/kg}$
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -82 Btu/lb = -45 cal/g =  $-1.9 \times 10^5 \text{ J/kg}$
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 30.04 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Low

### NOTES

# N-BUTYRIC ACID

BRA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	60.980	52	0.500	42	1.129	52	1.928
36	60.910	54	0.500	44	1.129	54	1.889
38	60.840	56	0.500	46	1.129	56	1.852
40	60.770	58	0.500	48	1.129	58	1.815
42	60.700	60	0.500	50	1.129	60	1.779
44	60.630	62	0.500	52	1.129	62	1.745
46	60.560	64	0.500	54	1.129	64	1.711
48	60.490	66	0.500	56	1.129	66	1.678
50	60.420	68	0.500	58	1.129	68	1.646
52	60.360	70	0.500	60	1.129	70	1.615
54	60.290	72	0.500	62	1.129	72	1.585
56	60.220	74	0.500	64	1.129	74	1.556
58	60.150	76	0.500	66	1.129	76	1.527
60	60.080	78	0.500	68	1.129	78	1.499
62	60.010	80	0.500	70	1.129	80	1.472
64	59.940	82	0.500	72	1.129	82	1.445
66	59.870	84	0.500	74	1.129	84	1.419
68	59.800	86	0.500	76	1.129	86	1.394
70	59.730	88	0.500			88	1.369
72	59.660	90	0.500			90	1.345
74	59.590	92	0.500			92	1.322
76	59.520	94	0.500			94	1.299
78	59.450	96	0.500			96	1.277
80	59.380	98	0.500			98	1.255
82	59.310	100	0.500			100	1.234
84	59.250	102	0.500			102	1.213

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	35	0.002	35	0.00003	0	0.278
	I	40	0.003	40	0.00004	20	0.287
	S	45	0.003	45	0.00005	40	0.296
	C	50	0.004	50	0.00007	60	0.304
	I	55	0.006	55	0.00009	80	0.313
	B	60	0.007	60	0.00011	100	0.321
	L	65	0.009	65	0.00014	120	0.330
	E	70	0.011	70	0.00018	140	0.338
		75	0.014	75	0.00022	160	0.346
		80	0.018	80	0.00027	180	0.354
		85	0.022	85	0.00033	200	0.362
		90	0.027	90	0.00041	220	0.369
		95	0.033	95	0.00049	240	0.377
		100	0.041	100	0.00060	260	0.384
		105	0.050	105	0.00072	280	0.392
		110	0.060	110	0.00087	300	0.399
		115	0.072	115	0.00103	320	0.406
		120	0.087	120	0.00123	340	0.413
		125	0.104	125	0.00146	360	0.420
		130	0.124	130	0.00173	380	0.427
		135	0.147	135	0.00203	400	0.433
		140	0.174	140	0.00238	420	0.440
		145	0.205	145	0.00279	440	0.446
		150	0.241	150	0.00325	460	0.453
		155	0.283	155	0.00377	480	0.459
						500	0.465

# BARIUM CARBONATE

BRC

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid crystals or powder      White      Odorless

Sinks in water.

Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.

**SOLID**  
If swallowed, will cause nausea and vomiting.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Dredge  
Clean shore line

## 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** BaCO<sub>3</sub>  
2.3 **IMO/UN Designation:** 6.1/1564  
2.4 **DOT ID No.:** 1564  
2.5 **CAS Registry No.:** 513-77-9  
2.6 **NAERG Guide No.:** 154  
2.7 **Standard Industrial Trade Classification:** 52379

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator
- 3.2 **Symptoms Following Exposure:** (INGESTION ONLY): excessive salivation, vomiting, severe abdominal pain, and violent purging with watery and bloody stools; a slow and often irregular pulse and a transient elevation in arterial blood pressure; tinnitus, giddiness and vertigo; muscle twitchings, progressing to convulsions and/or paralysis; dilated pupils with impaired accommodation; confusion and increasing somnolence, without coma; collapse and death from respiratory failure and cardiac arrest.
- 3.3 **Treatment of Exposure:** Rapid oral administration of a soluble sulfate in water, such as magnesium or sodium sulfate (2 oz), alum (4 gm), or very dilute sulfuric acid (30 ml of a 10% solution diluted to 1 qt). These agents precipitate barium as the insoluble sulfate. Gastric lavage or induced emesis. Seek medical attention.
- 3.4 **TLV-TWA:** 0.5 mg/m<sup>3</sup> as Ba
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rabbit, rat, guinea pig)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None observed.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** None
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 50 mg/m<sup>3</sup> as barium.
- 3.14 **OSHA PEL-TWA:** 0.5 mg/m<sup>3</sup> as barium.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent grade-99.0%; Ceramic grade-99.1%; Ceramic and chemical grade-99.3%; Glass grade- 98.8%; Electronic ceramic grade-99.6%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 197.35
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 4.3 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# BARIUM CARBONATE

BRC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.025		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BROMOACETONE

BRE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetonyl bromide Acetyl methyl bromide Bromomethyl methyl ketone 1-Bromo-2-propanone Bromo-2-propanone Monobromoacetone	Liquid  Sinks in water.	Colorless to violet  Pungent odor
Avoid contact with liquid and vapor. Keep people away. Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources. Call fire department. evacuate Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	FLAMMABLE Emits toxic fumes in fire. Flashback may occur along vapor trail. Containers may explode in fire. Wear self-contained breathing apparatus and full protective clothing. Extinguish with CO <sub>2</sub> , dry chemical, or foam.	
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR Extremely irritating to the eyes, nose, throat, and upper respiratory system. May be harmful if inhaled or absorbed through the skin. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Corrosive to eyes, skin, and upper respiratory tract. Harmful if swallowed or absorbed through the skin. IF IN EYES: hold eyelids open and flush with water for at least 15 minutes. Remove contaminated clothing and shoes, flush affected areas with plenty of water for at least 15 minutes. IF SWALLOWED: do nothing except keep victim warm. DO NOT INDUCE VOMITING.	
<b>Water Pollution</b>	Toxic to aquatic life in low concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Dilute and disperse Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>3</sub> H <sub>5</sub> BrO 2.3 IMO/UN Designation: 6.1/1569 2.4 DOT ID No.: 1569 2.5 CAS Registry No.: 598-31-2 2.6 NAERG Guide No.: 131 2.7 Standard Industrial Trade Classification: 51625
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus, chemical-resistant gloves, rubber boots, full protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Very powerful lachrymator and upper respiratory tract irritant. Intensely irritating to the eyes, nose, throat, and lungs. Corrosive to the skin. 3.3 <b>Treatment of Exposure:</b> Call a physician. EYES: Hold eyelids open, flush with running water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes, flush affected areas with plenty of water for at least 15 minutes. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Do nothing except keep victim warm. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Currently not available. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> May cause pulmonary edema. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 3.11 <b>Liquid or Solid Characteristics:</b> Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 124°F  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** CO<sub>2</sub>, dry chemical, foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective against fire.  
4.5 **Special Hazards of Combustion Products:** Toxic fumes of Bromine  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 16.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** TL<sub>96</sub>: 10-100 ppm  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: (4)  
Human Oral hazard: (3)  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** None  
7.4 **Venting:** None  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** P017  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 136.98  
9.3 **Boiling Point at 1 atm:** 277°F = 136°C = 409°K  
9.4 **Freezing Point:** -33.7°F = -36.5°C = 236.7°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.634 at 23°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.72  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# BROMOACETONE

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
59	102.010		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.148 0.152 0.155 0.159 0.163 0.167 0.171 0.175 0.179 0.183 0.187 0.191 0.195 0.199 0.202 0.206 0.210 0.214 0.218 0.222 0.226 0.230 0.234 0.238 0.242

# BROMOFORM

BRO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Formyl tribromide Methane, tribromo- Methenyl tribromide Methylene tribromide Methyl tribromide	Liquid  Colorless to yellow  Sweetish, chloroform-like  Sinks and very slowly mixes with water.
<b>AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.</b> Wear positive pressure breathing apparatus and special protective clothing. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish adjacent small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Harmful if inhaled; narcotic effects. Lachrymator; irritating to eyes, skin and respiratory tract. Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed, contacts skin or eyes, or is absorbed through skin. IF IN EYES OR ON SKIN, flush with running water for at least 15 min.; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS, have victim take syrup of ipecac to induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Pump; Dredge Dilute and disperse	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> Not listed. <b>2.2 Formula:</b> CHBr <sub>3</sub> <b>2.3 IMO/UN Designation:</b> 6.1/2515 <b>2.4 DOT ID No.:</b> 2515 <b>2.5 CAS Registry No.:</b> 75-25-2 <b>2.6 NAERG Guide No.:</b> 159 <b>2.7 Standard Industrial Trade Classification:</b> 51138
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Wear positive pressure breathing apparatus and special protective clothing. <b>3.2 Symptoms Following Exposure:</b> Harmful if inhaled, swallowed, contacts skin or eyes or is absorbed through skin. It is a lachrymator, respiratory irritant, a narcotic and an hepatotoxin. Prolonged exposure may cause dermatitis. Inhalation causes irritation of nose and throat; provokes the flow of tears and saliva and reddening of the face. Ingestion may cause dizziness, disorientation and slurred speech, unconsciousness and death. <b>3.3 Treatment of Exposure:</b> INHALATION: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If victim is conscious, have victim take syrup of ipecac to induce vomiting. <b>3.4 TLV-TWA:</b> 0.5 ppm (skin) <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 1.147 g/kg (rat) <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Causes mutagenic and tumorigenic effects. May cause liver damage and depression of the central nervous system. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Irritating to eyes, skin, pharynx, larynx, and respiratory tract; lachrymator. <b>3.11 Liquid or Solid Characteristics:</b> Irritating to eyes and skin. <b>3.12 Odor Threshold:</b> 1-6 mg/m <sup>3</sup> <b>3.13 IDLH Value:</b> 850 ppm. <b>3.14 OSHA PEL-TWA:</b> 0.5 ppm. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:**  
Not flammable
- 4.2 Flammable Limits in Air:** Not pertinent
- 4.3 Fire Extinguishing Agents:** Not flammable Extinguish adjacent small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.
- 4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 Special Hazards of Combustion Products:** Not pertinent
- 4.6 Behavior in Fire:** May decompose to produce toxic gases and vapor such as hydrogen bromide and bromine.
- 4.7 Auto Ignition Temperature:** Not pertinent
- 4.8 Electrical Hazards:** Currently not available
- 4.9 Burning Rate:** Not pertinent
- 4.10 Adiabatic Flame Temperature:** Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 Flame Temperature:** Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction
- 5.2 Reactivity with Common Materials:**  
Reacts with some forms of plastics, rubber and coatings. Reacts with powdered aluminum, zinc and magnesium.
- 5.3 Stability During Transport:** Stable.  
Protect from light and oxygen. Stabilized with 75 to 125 ppm diphenylamine or 1-3% ethanol.
- 5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 Polymerization:** Not pertinent
- 5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
1 mg/l/48 hr/eastern oyster larvae/LD<sub>50</sub>/saltwater  
56 ppm/24 hr/water flea/LC<sub>50</sub>/freshwater
- 6.2 Waterfowl Toxicity:** Currently not available
- 6.3 Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 Food Chain Concentration Potential:**  
Currently not available
- 6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 96%; 99%
- 7.2 Storage Temperature:** Ambient
- 7.3 Inert Atmosphere:** Currently not available
- 7.4 Venting:** Currently not available
- 7.5 IMO Pollution Category:** Currently not available
- 7.6 Ship Type:** Currently not available
- 7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Keep Away From Food
- 8.2 49 CFR Class:** 6.1
- 8.3 49 CFR Package Group:** III
- 8.4 Marine Pollutant:** Yes
- 8.5 NFPA Hazard Classification:** Not listed
- 8.6 EPA Reportable Quantity:** 100 pounds
- 8.7 EPA Pollution Category:** B
- 8.8 RCRA Waste Number:** U225
- 8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid
- 9.2 Molecular Weight:** 252.75
- 9.3 Boiling Point at 1 atm:** 302.9°F. = 150.5°C. = 423.7°K
- 9.4 Freezing Point:** 47.3°F. = 8.5°C. = 281.7°K.
- 9.5 Critical Temperature:** 796°F. = 425°C. = 698°K. (est)
- 9.6 Critical Pressure:** Currently not available
- 9.7 Specific Gravity:** 2.8912 at 20°C.
- 9.8 Liquid Surface Tension:** 41.53 dynes/cm = .04153 N/m at 20°C.
- 9.9 Liquid Water Interfacial Tension:** Currently not available
- 9.10 Vapor (Gas) Specific Gravity:** 8.7
- 9.11 Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 Latent Heat of Vaporization:** 68.9 Btu/lb = 38.3 cal/g = 1.60X10<sup>4</sup> KJ/kg
- 9.13 Heat of Combustion:** Not pertinent
- 9.14 Heat of Decomposition:** Not pertinent
- 9.15 Heat of Solution:** Currently not available
- 9.16 Heat of Polymerization:** Not pertinent
- 9.17 Heat of Fusion:** Currently not available
- 9.18 Limiting Value:** Currently not available
- 9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# BROMOFORM

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	180.500	260	0.074		C U R R E N T L Y  N O T  A V A I L A B L E	59	2.152

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.100	75 100 125 150 175 200 225 250 275 300	0.088 0.242 0.528 1.000 1.716 2.739 4.137 5.982 8.352 11.327	75 100 125 150 175 200 225 250 275 300	0.00398 0.01014 0.02095 0.03790 0.06255 0.09655 0.14160 0.19943 0.27186 0.36074	77	0.067

# BORON TRICHLORIDE

**BRT**

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Boron chloride	Liquid  Colorless  Irritating odor  Reacts violently with water. Irritating visible vapor cloud is produced. Boiling point is 54°F.
Restrict access. Evacuate. AVOID CONTACT WITH LIQUID AND VAPOR. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: BCl<sub>3</sub>
- 2.3 IMO/UN Designation: 2/1741
- 2.4 DOT ID No.: 1741
- 2.5 CAS Registry No.: 10294-34-5
- 2.6 NAERG Guide No.: 125
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical goggles; rubber protective clothing and gloves; self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** Inhalation causes edema and severe irritation of the upper respiratory system. Contact with liquid causes acid burns of eyes and severe burns of skin. Ingestion causes severe burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; give oxygen or apply artificial respiration; keep warm; call a doctor at once; observe for pulmonary edema. EYES: wash with plenty of water for 15 min.; consult an eye specialist. SKIN: wash off with plenty of water. INGESTION: do NOT induce vomiting; give large amount of water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Decomposes in moist air, releasing hydrochloric acid and decomposition products. Hydrochloric acid - 1 ppm
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Toxic fumes of hydrogen chloride are given off upon contact with water applied to adjacent fires.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously to liberate heat and forms hydrogen chloride fumes (hydrochloric acid) and boric acid.
- 5.2 **Reactivity with Common Materials:** Vigorously attacks elastomers and packing materials. Viton, Tygon, Saran, or silastic elastomers and natural and synthetic rubbers are not recommended for service. Lead and graphite-impregnated asbestos are to be avoided. In the presence of moisture, highly corrosive to most metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** C.P. (99.9+%)
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison gas
- 8.2 49 CFR Class: 2.3
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
21.60 X 10<sup>3</sup> J/kg
- 9.2 **Molecular Weight:** 117.2
- 9.3 **Boiling Point at 1 atm:** 54.3°F = 12.4°C = 285.6°K
- 9.4 **Freezing Point:** -161°F = -107°C = 166°K
- 9.5 **Critical Temperature:** 352.4°F = 178°C = 451.2°K
- 9.6 **Critical Pressure:** 566 psia = 38.5 atm = 3.90 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.35 at 11°C (liquid)
- 9.8 **Liquid Surface Tension:** 16.7 dynes/cm = 0.0167 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 4
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1470
- 9.12 **Latent Heat of Vaporization:** 68.8 Btu/lb = 38.2 cal/g =
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -13,000 Btu/lb = -7,200 cal/g = -300 X 10<sup>3</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 4.3 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BORON TRICHLORIDE

BRT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	88.759	34	0.214	-35	0.816	0	1.509
36	88.250	36	0.214	-30	0.811	5	1.448
38	87.750	38	0.215	-25	0.806	10	1.390
40	87.240	40	0.215	-20	0.801	15	1.335
42	86.730	42	0.215	-15	0.796	20	1.284
44	86.230	44	0.216	-10	0.791	25	1.236
46	85.719	46	0.216	-5	0.786	30	1.190
48	85.209	48	0.216	0	0.781	35	1.147
50	84.710	50	0.216	5	0.776	40	1.107
52	84.200	52	0.217	10	0.771	45	1.068
54	83.690	54	0.217	15	0.767	50	1.032
				20	0.762		
				25	0.757		
				30	0.752		
				35	0.747		
				40	0.742		
				45	0.737		
				50	0.732		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	-35	1.499	-35	0.03855	100	0.133
	E	-30	1.746	-30	0.04437	120	0.134
	A	-25	2.027	-25	0.05090	140	0.135
	C	-20	2.344	-20	0.05821	160	0.136
	T	-15	2.702	-15	0.06635	180	0.136
	S	-10	3.105	-10	0.07540	200	0.137
		-5	3.558	-5	0.08543	220	0.138
		0	4.064	0	0.09652	240	0.139
		5	4.629	5	0.10880	260	0.139
		10	5.258	10	0.12220	280	0.140
		15	5.956	15	0.13700	300	0.141
		20	6.729	20	0.15320	320	0.142
		25	7.584	25	0.17080	340	0.142
		30	8.527	30	0.19010	360	0.143
		35	9.564	35	0.21110	380	0.144
		40	10.700	40	0.23380	400	0.145
		45	11.950	45	0.25850	420	0.145
		50	13.310	50	0.28520	440	0.146
		55	14.800	55	0.31400	460	0.147
						480	0.148
						500	0.148
						520	0.149
						540	0.150
						560	0.151
						580	0.152
						600	0.152

# BRUCINE

BRU

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> (-)-Brucine dihydrate 10,11-Dimethoxystyrychne	Solid  White  Odorless  Sinks in water.
Restrict access. AVOID CONTACT WITH SOLID AND DUST. Wear dust respirator and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Irritating to eyes, nose and throat. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{21}H_{26}N_2O_4$  or  $C_{21}H_{26}N_2O_4 \cdot 2H_2O$   
2.3 IMO/UN Designation: 6.1/1570  
2.4 DOT ID No.: 1570  
2.5 CAS Registry No.: 357-57-3  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification: 51577

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Chemical is toxic if inhaled, swallowed, or absorbed through skin. Inhalation produces intense bitter taste. Ingestion causes nausea, vomiting, restlessness, excitement, twitching, and (rarely) convulsions. Contact with dust irritates eyes.  
3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure. INGESTION: induce vomiting; get medical attention at once. EYES: flush with water for 15 min.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; oral rat  $LD_{50} = 1$  mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 140.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 38.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Possible bioaccumulation problem for the duration of 1 week.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 3  
Human Contact hazard: 1  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** P018  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 394.4  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:**  $352^{\circ}\text{F} = 178^{\circ}\text{C} = 451^{\circ}\text{K}$   
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** >1 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:**  $-13,400$  Btu/lb =  $-7,440$  cal/g =  $-311 \times 10^3$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BRUCINE

BRU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BROMINE

BRX

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Watery liquid      Reddish-brown      Sharp irritating odor

Sinks in water. Irritating brown vapor is produced.

Restrict access.  
Evacuate.  
**AVOID CONTACT WITH LIQUID AND VAPOR.**  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
May cause fire on contact with combustibles.  
**POISONOUS GASES ARE PRODUCED IN FIRE.**  
Cool exposed containers with water.  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).

### Exposure

**CALL FOR MEDICAL AID.**

**VAPOR**  
Irritating to eyes, nose and throat.  
If inhaled, will cause coughing, difficult breathing, or loss of consciousness.  
Move to fresh air.  
If breathing has stopped, give artificial respiration (but NOT mouth to mouth).  
If breathing is difficult, give oxygen.

**LIQUID**  
Will burn skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

### Water Pollution

**HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.**  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump; Dredge  
Chemical and Physical Treatment:  
Absorb

## 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** Br<sub>2</sub>  
2.3 **IMO/UN Designation:** 8.0/1744  
2.4 **DOT ID No.:** 1744  
2.5 **CAS Registry No.:** 7726-95-6  
2.6 **NAERG Guide No.:** 154  
2.7 **Standard Industrial Trade Classification:** 52225

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles, face shield; self-contained air-line canister mask; rubber suit.
- 3.2 **Symptoms Following Exposure:** SKIN: contact with liquid or vapor may cause acne and slow-healing ulcers. INHALATION: induces severe irritation of the respiratory passages and pulmonary edema. Probable lethal oral dose for an adult is 1 ml. A brief exposure to 1000 ppm may be fatal.
- 3.3 **Treatment of Exposure:** SKIN AND EYES: wash well with water and sodium bicarbonate solution. RESPIRATORY SYSTEM: if there is obstruction to breathing establish airway by pulling tongue forward, inserting an airway tube, or doing a tracheostomy; begin artificial respiration; if difficulty in breathing is a result of pulmonary edema, treatment should be carried out with the patient in the sitting position. Administration of oxygen is most important; INGESTION: do not induce vomiting. Have victim drink water and milk.
- 3.4 **TLV-TWA:** 0.1 ppm  
3.5 **TLV-STEL:** 0.2 ppm  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Not pertinent  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Causes severe eye or throat irritations which can cause eye or lung injury; cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact; very injurious to the eyes.  
3.12 **Odor Threshold:** 3.5 ppm  
3.13 **IDLH Value:** 3 ppm  
3.14 **OSHA PEL-TWA:** 0.1 ppm.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Use water spray to cool exposed containers and to wash away spills.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are generated when heated or in fires.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Reacts violently with aluminum. May cause fire in contact with wood, cotton, straw. Iron, steel, stainless steel, and copper are corroded by bromine and are especially subject to attack by wet bromine. Of the plastics, only those which are highly fluorinated resist bromine attack.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
10 ppm/10 hr/cladophora/killed/fresh water  
10 ppm"/fish/irritant/salt water  
\*Time period not specified.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Not pertinent
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, technical
- 7.2 **Storage Temperature:** Cool but above 20°F to prevent freezing
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
| Special (White).....      | OX             |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 159.81
- 9.3 **Boiling Point at 1 atm:** 138°F = 58.8°C = 332°K
- 9.4 **Freezing Point:** 19°F = -7.2°C = 266°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 3.12 at 20°C (Liquid)
- 9.8 **Liquid Surface Tension:** 41 dynes/cm = .041 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 5.5 at 20°C
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.3
- 9.12 **Latent Heat of Vaporization:** 80.6 Btu/lb = 44.8 cal/g = 1.88 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 16.1 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# BROMINE

BRX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	198.699	56	0.107	45	0.880	24	1.312
40	198.199	58	0.107	50	0.875	26	1.294
45	197.599	60	0.107	55	0.871	28	1.277
50	197.000	62	0.107	60	0.867	30	1.259
55	196.400	64	0.107	65	0.862	32	1.242
60	195.799	66	0.107	70	0.858	34	1.226
65	195.199	68	0.107	75	0.854	36	1.209
70	194.599	70	0.107	80	0.849	38	1.194
75	194.000	72	0.107	85	0.845	40	1.178
80	193.400	74	0.107	90	0.841	42	1.163
85	192.799	76	0.107	95	0.836	44	1.148
90	192.299	78	0.107	100	0.832	46	1.133
95	191.699	80	0.107	105	0.828	48	1.119
		82	0.107	110	0.823	50	1.105
		84	0.107	115	0.819	52	1.091
		86	0.107			54	1.078
		88	0.107			56	1.065
		90	0.107			58	1.052
		92	0.107			60	1.039
		94	0.107			62	1.027
		96	0.107			64	1.014
		98	0.107			66	1.002
		100	0.107			68	0.991
		102	0.107			70	0.979
		104	0.107			72	0.968
		106	0.107			74	0.957

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	3.500	20	0.892	20	0.02769	100	0.055
		25	1.035	25	0.03180	120	0.055
		30	1.198	30	0.03642	140	0.055
		35	1.382	35	0.04158	160	0.055
		40	1.589	40	0.04735	180	0.055
		45	1.823	45	0.05378	200	0.055
		50	2.086	50	0.06092	220	0.055
		55	2.380	55	0.06893	240	0.055
		60	2.708	60	0.07759	260	0.055
		65	3.075	65	0.08724	280	0.055
		70	3.482	70	0.09788	300	0.055
		75	3.935	75	0.10960	320	0.055
		80	4.436	80	0.12240	340	0.055
		85	4.990	85	0.13640	360	0.055
		90	5.602	90	0.15170	380	0.055
		95	6.275	95	0.16840	400	0.055
		100	7.015	100	0.18660	420	0.055
						440	0.055
						460	0.055
						480	0.055
						500	0.055
						520	0.056
						540	0.056
						560	0.056
						580	0.056
						600	0.056

# BENZENESULFONYL CHLORIDE

BSC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzene sulfochloride Benzenesulfochloride Benzene sulfonechloride Benzenesulfonic (acid) chloride	Liquid  Colorless  Pungent  Sinks in water and slowly decomposes. Melting point is 58.1°F.
<b>AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.</b> Wear positive pressure breathing apparatus and special protective clothing. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Poisonous gases are produced in fires or when heated. Containers may explode in fire. Wear positive pressure breathing apparatus and special protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: with water spray, fog or foam. Move containers from fire area if you can do it without risk.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be fatal if inhaled. Irritating to eyes, skin and mucous membranes. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. May be fatal if swallowed or absorbed through skin. IF IN EYES OR ON SKIN, flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. Maintain normal body temperature and keep victim quiet. Hold victim for observation for delayed effects. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 0; Unassigned cargoes  
2.2 Formula: C<sub>6</sub>H<sub>5</sub>SO<sub>2</sub>Cl  
2.3 IMO/UN Designation: 8/2225  
2.4 DOT ID No.: 2225  
2.5 CAS Registry No.: 98-09-9  
2.6 NAERG Guide No.: 156  
2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear positive pressure breathing apparatus and special protective clothing.  
3.2 **Symptoms Following Exposure:** May be fatal if inhaled, swallowed or absorbed through skin. Contact may cause skin and eye burns. Irritating to eyes, skin and mucous membranes. INGESTION: May cause abdominal spasm and vomiting.  
3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. Maintain normal body temperature and keep victim quiet. Keep victim under observation for delayed effects. INGESTION: If unconscious or having convulsions, do nothing except keep victim warm.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 1.96 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Causes irritation of eyes, skin and mucous membranes.  
3.11 **Liquid or Solid Characteristics:** May cause burns to skin and eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
>233.6°F. C.C  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion**  
**Products:** May contain highly toxic and irritating hydrogen chloride and oxides of chlorine and sulfur.  
4.6 **Behavior in Fire:** Cylinder may explode. Decomposes to produce highly toxic chlorine and sulfur compounds. Reacts with hot water to produce highly toxic and corrosive hydrochloric acid and benzenesulfonic acid.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Decomposes in hot water to produce corrosive and toxic hydrochloric acid and benzenesulfonic acid. Rate of reaction decreases as temperature decreases.  
5.2 **Reactivity with Common Materials:** Incompatible with strong oxidizers and bases. Corrosive to metals in the presence of water due to formation of hydrochloric acid and benzenesulfonic acid.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
3 mg/l 48 hr/ brown trout yearlings/ LC<sub>50</sub>/ freshwater  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 96%; 99%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U020  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 176.62  
9.3 **Boiling Point at 1 atm:** 484.7°F = 251.5°C = 524.7°K  
9.4 **Freezing Point:** 58.1°F = 14.5°C = 287.7°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.3842 at 15°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 6.09 (est.)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BENZENESULFONYL CHLORIDE

BSC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
59	86.500		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	175 200 225 250 275 300 325 350 375 400	0.039 0.084 0.165 0.302 0.523 0.863 1.367 2.094 3.115 4.515	175 200 225 250 275 300 325 350 375 400	0.00088 0.00175 0.00319 0.00547 0.00890 0.01388 0.02089 0.03051 0.04341 0.06037		C U R R E N T L Y  N O T  A V A I L A B L E

# SEC-BUTYL ACETATE

BTA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, sec-butyl ester	Watery liquid  Colorless  Pleasant, fruity odor  Floats on water. Flammable, irritating vapor is produced.
<b>Restrict access.</b> Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, headache or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $\text{CH}_3\text{COOCH}(\text{CH}_3)\text{CH}_2\text{CH}_3$   
2.3 IMO/UN Designation: 3.2/1123  
2.4 DOT ID No.: 1123  
2.5 CAS Registry No.: 105-46-4  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self contained breathing apparatus; chemical goggles or face splash shield.
- 3.2 **Symptoms Following Exposure:** Headaches, dizziness, nausea, irritation of respiratory passage and eyes.
- 3.3 **Treatment of Exposure:** INHALATION: if victim is overcome by vapors, remove from exposure immediately; call a physician; if breathing is irregular or stopped, start resuscitation and administer oxygen. EYES: flush with water for at least 15 min.
- 3.4 **TLV-TWA:** 200 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 1,700 ppm.
- 3.14 **OSHA PEL-TWA:** 200 ppm.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 88°F O.C. 62°F C.C.
- 4.2 **Flammable Limits in Air:** 1.7% 9.8%
- 4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 4.4 mm/min. (approx.)
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Dissolves rubber and plastics.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 0.15 to 0.5 lb/lb, 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical and Pure
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester) or pressure-vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 116.16
- 9.3 **Boiling Point at 1 atm:** 234°F = 112°C = 385°K
- 9.4 **Freezing Point:** -100°F = -73.5°C = 199.7°K
- 9.5 **Critical Temperature:** 550.4°F = 288°C = 561.2°K
- 9.6 **Critical Pressure:** 469 psia = 32 atm = 3.2 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.872 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 23.3 dynes/cm = 0.0233 N/m at 21°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 58 dynes/cm = 0.058 N/m at 17°C
- 9.10 **Vapor (Gas) Specific Gravity:** 4.0
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.061
- 9.12 **Latent Heat of Vaporization:** (est.) 130 Btu/lb = 74 cal/g = 3.1 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** (est.) -13,100 Btu/lb = -7300 cal/g = -305 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 1.0 psia

### NOTES

# SEC-BUTYL ACETATE

BTA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	54.710	28	0.478	45	1.067	45	0.836
65	54.540	30	0.478	50	1.063	50	0.811
70	54.370	32	0.478	55	1.059	55	0.787
75	54.200	34	0.478	60	1.056	60	0.764
80	54.030	36	0.478	65	1.052	65	0.743
85	53.850	38	0.478	70	1.048	70	0.722
90	53.670	40	0.478	75	1.044	75	0.702
95	53.490	42	0.478	80	1.040	80	0.684
100	53.310	44	0.478	85	1.036	85	0.666
105	53.120	46	0.478	90	1.032	90	0.648
110	52.940	48	0.478	95	1.029	95	0.632
115	52.750	50	0.478	100	1.025	100	0.616
120	52.560	52	0.478	105	1.021	105	0.601
125	52.370	54	0.478	110	1.017	110	0.587
130	52.170	56	0.478	115	1.013	115	0.573
135	51.970	58	0.478	120	1.009		
140	51.780	60	0.478	125	1.005		
145	51.580	62	0.478	130	1.002		
150	51.370	64	0.478	135	0.998		
155	51.170	66	0.478	140	0.994		
160	50.960	68	0.478	145	0.990		
165	50.750	70	0.478	150	0.986		
170	50.540	72	0.478	155	0.982		
175	50.330	74	0.478	160	0.978		
180	50.110	76	0.478	165	0.975		
185	49.900	78	0.478	170	0.971		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	40	0.154	40	0.00334	0	0.266
	N	50	0.217	50	0.00461	25	0.278
	S	60	0.301	60	0.00626	50	0.289
	O	70	0.410	70	0.00838	75	0.301
	L	80	0.551	80	0.01105	100	0.312
	U	90	0.731	90	0.01439	125	0.324
	B	100	0.958	100	0.01852	150	0.335
	I	110	1.240	110	0.02356	175	0.346
	E	120	1.589	120	0.02967	200	0.356
		130	2.015	130	0.03698	225	0.367
		140	2.531	140	0.04567	250	0.377
		150	3.151	150	0.05592	275	0.387
		160	3.889	160	0.06791	300	0.397
		170	4.762	170	0.08183	325	0.407
		180	5.787	180	0.09789	350	0.417
		190	6.982	190	0.11630	375	0.426
		200	8.368	200	0.13730	400	0.435
		210	9.965	210	0.16100	425	0.445
						450	0.453
						475	0.462
						500	0.471
						525	0.479
						550	0.487
						575	0.496
						600	0.504

# BORON TRIBROMIDE

BTB

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid                      Colorless                      Sharp odor

Reacts violently with water. Poisonous vapor is produced.

Restrict access.  
Evacuate.  
Avoid contact with liquid and vapor.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
POISONOUS GASES MAY BE PRODUCED IN FIRE.  
Wear goggles and self-contained breathing apparatus.  
DO NOT USE WATER ON ADJACENT FIRES.

### Exposure

CALL FOR MEDICAL AID.

VAPOR  
Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

LIQUID  
Will burn skin and eyes.  
If swallowed will cause nausea and vomiting.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: BBr<sub>3</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2692  
2.5 CAS Registry No.: 10294-33-4  
2.6 NAERG Guide No.: 157  
2.7 Standard Industrial Trade Classification: 52329

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety glasses or face mask, rubber gloves, and respiratory protection
- 3.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of mucous membranes. Ingestion causes burns of mouth and stomach. Contact with eyes or skin causes severe burns.
- 3.3 **Treatment of Exposure:** Get medical attention for all exposures to this chemical. **INHALATION:** remove from exposure; support respiration. **INGESTION:** give large amounts of water. **EYES:** flush with water for at least 15 min. **SKIN:** wash thoroughly with water; launder clothing before reuse.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 1 ppm.
- 3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water or foam on adjacent fires.
- 4.5 **Special Hazards of Combustion Products:** Toxic fumes of the chemical or hydrogen bromide may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently to form hydrobromic acid solution and fumes.
- 5.2 **Reactivity with Common Materials:**  
Strongly attacks metals and wood.  
Flammable hydrogen gas may collect in enclosed spaces.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Epitaxial, 99.999+%; Pure, 99.99+%; Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Padded
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 250.5
- 9.3 **Boiling Point at 1 atm:** 196°F = 91°C = 364°K
- 9.4 **Freezing Point:** -51°F = -46°C = 227°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.645 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 29.1 dynes/cm = 0.0291 N/m at 22°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 8.64
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.140
- 9.12 **Latent Heat of Vaporization:** 52 Btu/lb = 29 cal/g = 1.2 X 10 J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 2.9 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# BORON TRIBROMIDE

BTB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
10	170.799	N O T  P E R T I N E N T			N O T  P E R T I N E N T	40	0.876
15	170.299					45	0.852
20	169.799					50	0.830
25	169.299					55	0.808
30	168.799					60	0.787
35	168.299					65	0.768
40	167.699					70	0.749
45	167.199					75	0.731
50	166.699					80	0.714
55	166.199					85	0.697
60	165.699					90	0.681
65	165.199					95	0.666
70	164.599					100	0.651
75	164.099					105	0.637
80	163.599					110	0.624
85	163.099					115	0.611
90	162.599					120	0.598
95	162.099					125	0.586
100	161.599					130	0.575
105	161.000					135	0.563
110	160.500					140	0.553
115	160.000					145	0.542
120	159.500					150	0.532
125	159.000					155	0.522
130	158.500					160	0.513
135	157.900					165	0.504

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
R E A C T I V E		40	0.472	40	0.02202	85	0.065
		45	0.548	45	0.02536	90	0.065
		50	0.635	50	0.02909	95	0.065
		55	0.734	55	0.03327	100	0.065
		60	0.844	60	0.03792	105	0.065
		65	0.969	65	0.04310	110	0.065
		70	1.108	70	0.04884	115	0.065
		75	1.264	75	0.05518	120	0.065
		80	1.438	80	0.06218	125	0.065
		85	1.631	85	0.06987	130	0.065
		90	1.845	90	0.07832	135	0.065
		95	2.081	95	0.08757	140	0.065
		100	2.342	100	0.09767	145	0.065
		105	2.630	105	0.10870	150	0.065
		110	2.946	110	0.12070	155	0.065
		115	3.292	115	0.13370	160	0.065
		120	3.671	120	0.14780	165	0.065
		125	4.084	125	0.16300	170	0.065
		130	4.535	130	0.17950		
		135	5.025	135	0.19720		
		140	5.557	140	0.21630		
		145	6.134	145	0.23670		
		150	6.758	150	0.25870		
		155	7.432	155	0.28220		
		160	8.159	160	0.30730		
		165	8.943	165	0.33410		

# N-BUTYL ACRYLATE

BTC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acrylic acid, n-butyl ester Butyl acrylate n-Butyl 2-propenoate	Watery liquid  Colorless  Sharp, fragrant odor  Floats on water.
<b>Restrict access.</b> Shut off ignition sources and call fire department Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Containers may explode in fire. Extinguish with dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 14; Acrylates  
2.2 Formula:  $\text{CH}_2=\text{CHCOO}(\text{CH}_2)_3\text{CH}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2348  
2.5 CAS Registry No.: 141-32-2  
2.6 NAERG Guide No.: 129P  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber gloves, acid goggles.  
3.2 **Symptoms Following Exposure:** Vapor is irritating when breathed at high concentrations. Contact with liquid causes irritation of skin and burning of eyes.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; administer artificial respiration or oxygen if indicated; call a physician. SKIN AND EYES: wash with plenty of water.  
3.4 **TLV-TWA:** 10 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 118°F O.C.  
4.2 **Flammable Limits in Air:** 1.4%-9.4%  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 534°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4.7 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Will polymerize on application of heat; uncontrolled bulk polymerization can be explosive.  
5.6 **Inhibitor of Polymerization:** Methyl ether of hydroquinone: 15-100 ppm. Store in contact with air.

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	2

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 128.17  
9.3 **Boiling Point at 1 atm:** 299.8°F = 148.8°C = 422.0°K  
9.4 **Freezing Point:** -83°F = -64°C = 209°K  
9.5 **Critical Temperature:** 620.6°F = 327°C = 600.2°K  
9.6 **Critical Pressure:** 426 psia = 29 atm = 2.9 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.899 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 27°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 60 dynes/cm = 0.060 N/m at 27°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.080  
9.12 **Latent Heat of Vaporization:** 120 Btu/lb = 66.4 cal/g = 2.78 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -13,860 Btu/lb = -7700 cal/g = -322.4 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** -25.9 Btu/lb = -144 cal/g = -6.03 X 10<sup>5</sup> J/kg  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.2 psia

### NOTES



# N-BUTYL ACRYLATE

BTC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	57.200	35	0.412	45	1.067	35	1.130
40	57.030	40	0.414	50	1.063	40	1.077
45	56.850	45	0.417	55	1.059	45	1.028
50	56.680	50	0.420	60	1.056	50	0.981
55	56.510	55	0.423	65	1.052	55	0.938
60	56.330	60	0.425	70	1.048	60	0.897
65	56.160	65	0.428	75	1.044	65	0.858
70	55.990	70	0.431	80	1.040	70	0.822
75	55.810	75	0.434	85	1.036	75	0.789
80	55.640	80	0.437	90	1.032	80	0.757
85	55.470	85	0.439	95	1.029	85	0.727
90	55.290	90	0.442	100	1.025	90	0.698
95	55.120	95	0.445	105	1.021	95	0.672
100	54.950	100	0.448	110	1.017	100	0.646
105	54.770	105	0.450	115	1.013	105	0.623
110	54.600	110	0.453	120	1.009	110	0.600
115	54.430	115	0.456	125	1.005	115	0.579
120	54.250	120	0.459	130	1.002	120	0.558
				135	0.998		
				140	0.994		
				145	0.990		
				150	0.986		
				155	0.982		
				160	0.978		
				165	0.975		
				170	0.971		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.200	20	0.013	20	0.00031	0	0.336
		30	0.019	30	0.00046	25	0.348
		40	0.028	40	0.00067	50	0.359
		50	0.041	50	0.00095	75	0.371
		60	0.058	60	0.00133	100	0.382
		70	0.082	70	0.00185	125	0.393
		80	0.114	80	0.00252	150	0.403
		90	0.157	90	0.00341	175	0.414
		100	0.214	100	0.00456	200	0.424
		110	0.288	110	0.00604	225	0.434
		120	0.384	120	0.00791	250	0.444
		130	0.507	130	0.01026	275	0.454
		140	0.663	140	0.01320	300	0.464
		150	0.859	150	0.01683	325	0.473
		160	1.105	160	0.02128	350	0.483
		170	1.409	170	0.02671	375	0.492
						400	0.501
						425	0.509
						450	0.518
						475	0.526
						500	0.535
						525	0.543
						550	0.550
						575	0.558
						600	0.566

# 1,4-BUTYNEDIOL

BTD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Butyne-1, 4-diol 1,4-Dihydroxy-2-butyne		Solid crystals, or watery solution	Solid is white to light yellow Solution is brownish yellow
		Sinks and mixes with water.	
Call fire department. Avoid contact with liquid and solid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible Extinguish with water, alcohol foam, dry chemical or carbon dioxide.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{HOCH}_2\text{CCH}_2\text{OH}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2716
- 2.5 CAS Registry No.: 110-65-6
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51229

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Neoprene rubber gloves and safety goggles or face shield.
- 3.2 **Symptoms Following Exposure:** May cause dermatitis.
- 3.3 **Treatment of Exposure:** SKIN CONTACT: wash affected skin area thoroughly with water. EYE CONTACT: immediately wash with water for at least 15 minutes and get medical attention.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50} = 50$  to  $500 \text{ mg/kg}$
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Not pertinent
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  $263^\circ\text{F}$  O.C. (pure butynediol)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, alcohol foam, dry chemical, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** May explode on contact with mercury salts, strong acids and alkaline earth hydroxides and halides.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Tech. Flake: 96% 35% solution
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at  $15^\circ\text{C}$  and 1 atm:** Solid
- 9.2 **Molecular Weight:** 36.09
- 9.3 **Boiling Point at 1 atm:**  $460^\circ\text{F} = 238^\circ\text{C} = 511^\circ\text{K}$
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.07 at  $20^\circ\text{C}$  (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:**  $-11,020 \text{ Btu/lb} = -6120 \text{ cal/g} = -256.2 \times 10^3 \text{ J/kg}$
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1,4-BUTYNE DIOL

BTD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	121.500		N O T		N O T		N O T
36	122.099						
38	122.700						
40	123.200						
42	123.799		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	124.299						
46	124.900						
48	125.400						
50	126.000						
52	126.500						
54	127.099						
56	127.700						
58	128.199						
60	128.799						
62	129.299						
64	129.900						
66	130.400						
68	131.000						
70	131.500						
72	132.099						
74	132.699						
76	133.199						
78	133.799						
80	134.299						
82	134.900						
84	135.400						

# BROMINE TRIFLUORIDE

BTF

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless	Extremely irritating odor
Reacts violently with water. Poisonous gas is produced on contact with water. Freezing point is 28°F.			
Restrict access. Evacuate. AVOID CONTACT WITH LIQUID AND VAPOR. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
Fire	Not flammable. May cause fire on contact with combustibles. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE.		
Exposure	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: BrF<sub>3</sub>  
2.3 IMO/UN Designation: 8/1746  
2.4 DOT ID No.: 1746  
2.5 CAS Registry No.: 7787-71-5  
2.6 NAERG Guide No.: 144  
2.7 Standard Industrial Trade Classification: 52241

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; complete protective clothing; safety glasses; face shield.
- 3.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory system. Contact with liquid or vapor causes severe burns of eyes and can cause ulcers and blindness. Contact with skin causes severe burns. Ingestion causes severe burns of mucous membranes.
- 3.3 **Treatment of Exposure:** Get immediate medical attention for all exposures. **INHALATION:** remove from exposure; support respiration. **EYES:** irrigate with copious amounts of water for at least 15 min. **SKIN:** wash with large amounts of water for at least 15 min., then rinse with sodium bicarbonate or lime solution.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available.  
3.11 **Liquid or Solid Characteristics:** Currently not available.  
3.12 **Odor Threshold:** Currently not available.  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed.

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable but may cause fire on contact with combustibles.
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Forms very toxic and irritating fumes.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously to generate toxic hydrogen fluoride gas (hydrofluoric acid).
- 5.2 **Reactivity with Common Materials:** Will cause severe corrosion of common metals and glass. May cause fire in contact with organic materials such as wood, cotton, or straw.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (3)  
Human Oral hazard: (3)  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 136.9
- 9.3 **Boiling Point at 1 atm:** 258.4°F = 125.8°C = 399.0°K
- 9.4 **Freezing Point:** 47.8°F = 8.8°C = 282.0°K
- 9.5 **Critical Temperature:** (est.) 621°F = 327°C = 600°K
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.81 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 36.3 dynes/cm = 0.0363 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 4.7
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1428
- 9.12 **Latent Heat of Vaporization:** 130 Btu/lb = 74 cal/g = 3.1 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BROMINE TRIFLUORIDE

BTF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
55	176.500	52	0.220	51	1.612	51	4.064
60	176.099	54	0.220	52	1.612	52	4.005
65	175.699	56	0.220	53	1.612	53	3.948
70	175.199	58	0.220	54	1.612	54	3.892
75	174.799	60	0.220	55	1.612	55	3.836
80	174.400	62	0.220	56	1.612	56	3.782
85	173.900	64	0.220	57	1.612	57	3.729
90	173.500	66	0.220	58	1.612	58	3.677
95	173.099	68	0.220	59	1.612	59	3.625
100	172.599	70	0.220	60	1.612	60	3.575
105	172.199	72	0.220	61	1.612	61	3.525
110	171.799	74	0.220	62	1.612	62	3.476
115	171.299	76	0.220	63	1.612	63	3.428
120	170.900	78	0.220	64	1.612	64	3.381
125	170.500	80	0.220	65	1.612	65	3.335
130	170.000	82	0.220	66	1.612	66	3.290
135	169.599	84	0.220	67	1.612	67	3.245
140	169.199	86	0.220	68	1.612	68	3.201
145	168.699			69	1.612	69	3.158
150	168.299			70	1.612	70	3.116
155	167.900			71	1.612	71	3.074
				72	1.612	72	3.033
				73	1.612	73	2.993
				74	1.612	74	2.954
				75	1.612	75	2.915
				76	1.612	76	2.877

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	70	0.118	70	0.00283	0	0.116
	E	75	0.141	75	0.00336	10	0.116
	A	80	0.168	80	0.00398	20	0.116
	C	85	0.200	85	0.00470	30	0.116
	T	90	0.238	90	0.00551	40	0.116
	S	95	0.281	95	0.00645	50	0.116
		100	0.330	100	0.00753	60	0.116
		105	0.387	105	0.00875	70	0.116
		110	0.453	110	0.01014	80	0.116
		115	0.528	115	0.01171	90	0.116
		120	0.613	120	0.01348	100	0.116
		125	0.709	125	0.01547	110	0.116
		130	0.819	130	0.01771	120	0.116
		135	0.943	135	0.02022	130	0.116
		140	1.082	140	0.02301	140	0.116
		145	1.239	145	0.02613	150	0.116
		150	1.414	150	0.02959	160	0.116
		155	1.611	155	0.03342	170	0.116
		160	1.830	160	0.03767		
		165	2.074	165	0.04235		
		170	2.345	170	0.04750		
		175	2.646	175	0.05317		
		180	2.978	180	0.05938		
		185	3.345	185	0.06618		
		190	3.750	190	0.07361		
		195	4.195	195	0.08172		

# SEC-BUTYLAMINE

BTL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Liquid  Mixes with water.	White	Ammonia-like odor
<b>Restrict access.</b> <b>Evacuate.</b> <b>Shut off ignition sources. Call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Wear rubber overclothing (including gloves).</b> <b>Stay upwind. Use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea and vomiting Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amine  
2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{NH}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 513-49-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51489

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles; rubber gloves and apron; respiratory protective equipment; non-sparking shoes  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation or burns of the respiratory system; exposure to concentrated vapors can cause asphyxiation. Ingestion causes burns of mouth and stomach. Contact with eyes causes lachrymation, conjunctivitis, burns, corneal edema. Contact with skin causes irritation or burns, dermatitis.  
3.3 **Treatment of Exposure:** INHALATION: remove patient from exposure; keep him quiet; contact physician. INGESTION: give large amount of water; induce vomiting; consult a physician. EYES: flush thoroughly with water for 15 min.; call physician immediately. SKIN: remove all contaminated clothing; flood affected area with large quantities of water; consult a physician.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral  $\text{LD}_{50} = 380 \text{ mg/kg}$  (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and-third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 16°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** "Alcohol" foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may be formed in fire.  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back. Containers may explode in fire.  
4.7 **Auto Ignition Temperature:** 712°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 6.18 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 36.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May corrode some metals in presence of water.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	-

  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 73.1  
9.3 **Boiling Point at 1 atm:** 145°F = 63°C = 336°K  
9.4 **Freezing Point:** -155°F = -104°C = 169°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.721 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 22.42 dynes/cm = 0.02242 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.52  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.073 at 20°C  
9.12 **Latent Heat of Vaporization:** 178.09 Btu/lb = 98.94 cal/g = 4.160 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -17,600 Btu/lb = -9,780 cal/g = 409 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -170 Btu/lb = -93 cal/g = -3.9 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 6.1 psia

### NOTES

# SEC-BUTYLAMINE

BTL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	46.120	60	0.480	60	1.048		C U R R E N T L Y  N O T  A V A I L A B L E
36	46.050	61	0.480	61	1.048		
38	45.980	62	0.480	62	1.048		
40	45.910	63	0.480	63	1.048		
42	45.850	64	0.480	64	1.048		
44	45.780	65	0.480	65	1.048		
46	45.710	66	0.480	66	1.048		
48	45.640	67	0.480	67	1.048		
50	45.570	68	0.480	68	1.048		
52	45.500	69	0.480	69	1.048		
54	45.430	70	0.480	70	1.048		
56	45.360	71	0.480	71	1.048		
58	45.290	72	0.480	72	1.048		
60	45.220	73	0.480	73	1.048		
62	45.150	74	0.480	74	1.048		
64	45.080	75	0.480	75	1.048		
66	45.010	76	0.480	76	1.048		
68	44.940	77	0.480	77	1.048		
70	44.870						
72	44.810						
74	44.740						
76	44.670						
78	44.600						
80	44.530						
82	44.460						
84	44.390						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	35	0.896	35	0.01233	0	0.357
		40	1.074	40	0.01464	20	0.369
		45	1.283	45	0.01732	40	0.381
		50	1.528	50	0.02041	60	0.393
		55	1.813	55	0.02399	80	0.405
		60	2.144	60	0.02810	100	0.416
		65	2.528	65	0.03281	120	0.428
		70	2.971	70	0.03819	140	0.439
		75	3.481	75	0.04433	160	0.450
		80	4.066	80	0.05131	180	0.462
		85	4.737	85	0.05922	200	0.472
		90	5.503	90	0.06817	220	0.483
		95	6.375	95	0.07827	240	0.494
		100	7.367	100	0.08963	260	0.504
						280	0.514
						300	0.525
						320	0.535
						340	0.544
						360	0.554
						380	0.564
						400	0.573
						420	0.582
						440	0.591

# N-BUTYL MERCAPTAN

BTM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Butanethiol Thiobutyl alcohol	Liquid	Colorless to yellow	Skunk like odor
Floats on water. Poisonous vapor is produced.			
<div>Restrict access.</div> <div>AVOID CONTACT WITH LIQUID AND VAPOR.</div> <div>Wear goggles and self-contained breathing apparatus.</div> <div>Shut off ignition sources. Call fire department.</div> <div>Evacuate area in case of large discharge.</div> <div>Notify local health and pollution control agencies.</div> <div>Protect water intakes.</div>			
<b>Fire</b>	<div>FLAMMABLE.</div> <div>Irritating gases may be produced when heated.</div> <div>Containers may explode in fire.</div> <div>Flashback along vapor trail may occur.</div> <div>Vapor may explode if ignited in an enclosed area.</div> <div>Extinguish with dry chemicals, alcohol foam, or carbon dioxide.</div> <div>Water may be ineffective on fire.</div> <div>Cool exposed containers with water.</div>		
<b>Exposure</b>	<div>CALL FOR MEDICAL AID.</div> <div>VAPOR</div> <div>POISONOUS IF INHALED.</div> <div>Irritating to eyes.</div> <div>Move victim to fresh air.</div> <div>If breathing has stopped, give artificial respiration.</div> <div>If breathing is difficult, give oxygen.</div> <div>LIQUID</div> <div>Irritating to skin and eyes.</div> <div>Harmful if swallowed.</div> <div>Remove contaminated clothing and shoes.</div> <div>Flush affected areas with plenty of water.</div> <div>IF IN EYES, hold eyelids open and flush with plenty of water.</div> <div>IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.</div> <div>IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</div>		
<b>Water Pollution</b>	<div>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</div> <div>Fouling to shoreline.</div> <div>May be dangerous if it enters water intakes.</div> <div>Notify local health and wildlife officials.</div> <div>Notify operators of nearby water intakes.</div>		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Clean shore line  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{SH}$   
2.3 IMO/UN Designation: 3.1/2347  
2.4 DOT ID No.: 2347  
2.5 CAS Registry No.: 109-79-5  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Plastic gloves, goggles; self-contained breathing apparatus.  
3.2 **Symptoms Following Exposure:** Inhalation causes loss of sense of smell; muscular weakness, convulsions, and respiratory paralysis may follow prolonged exposure. Contact of liquid with eyes or skin causes slight irritation. Ingestion causes nausea.  
3.3 **Treatment of Exposure:** INHALATION: remove victim from contaminated atmosphere, give artificial respiration and oxygen if needed; observe for signs of pulmonary edema. EYES: wash with plenty of water; see a physician. SKIN: wash with soap and water. INGESTION: induce vomiting and follow with gastric lavage.  
3.4 **TLV-TWA:** 0.5 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50}$  = 1,500 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** 0.001 ppm  
3.13 **IDLH Value:** 500 ppm  
3.14 **OSHA PEL-TWA:** 10 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 55°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water  
4.5 **Special Hazards of Combustion Products:** Irritating sulfur dioxide may form.  
4.6 **Behavior in Fire:** Vapors are heavier than air and may travel long distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 7.4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Strong oxidizers  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** 7.3 mg/l/24 hr/fish/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: -  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 98+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Stable  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 90.2  
9.3 **Boiling Point at 1 atm:** 229.3°F = 98.5°C = 317.7°K  
9.4 **Freezing Point:** -176.2°F = -115.7°C = 157.5°K  
9.5 **Critical Temperature:** 554.0°F = 290°C = 563.2°K  
9.6 **Critical Pressure:** 572 psia = 38.9 atm = 3.94 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.841 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 26.1 dynes/cm = 0.0261 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 30 dynes/cm = 0.030 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 6.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0770 at 16°C  
9.12 **Latent Heat of Vaporization:** 154.0 Btu/lb = 85.58 cal/g = 3.583 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -16,601 Btu/lb = -9,223 cal/g = -386 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# N-BUTYL MERCAPTAN

BTM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	53.740	34	0.441	51	1.048	52	0.548
36	53.670	36	0.442	52	1.048	54	0.541
38	53.600	38	0.443	53	1.048	56	0.534
40	53.530	40	0.444	54	1.048	58	0.527
42	53.460	42	0.446	55	1.048	60	0.520
44	53.390	44	0.447	56	1.048	62	0.514
46	53.320	46	0.448	57	1.048	64	0.508
48	53.250	48	0.449	58	1.048	66	0.501
50	53.180	50	0.450	59	1.048	68	0.495
52	53.110	52	0.451	60	1.048	70	0.489
54	53.040	54	0.452	61	1.048	72	0.484
56	52.980	56	0.453	62	1.048	74	0.478
58	52.910	58	0.454	63	1.048	76	0.472
60	52.840	60	0.456	64	1.048	78	0.467
62	52.770	62	0.457	65	1.048	80	0.461
64	52.700	64	0.458	66	1.048	82	0.456
66	52.630	66	0.459	67	1.048	84	0.451
68	52.560	68	0.460	68	1.048	86	0.446
70	52.490	70	0.461	69	1.048		
72	52.420	72	0.462	70	1.048		
74	52.350	74	0.463	71	1.048		
76	52.280	76	0.464	72	1.048		
78	52.210	78	0.466	73	1.048		
80	52.140	80	0.467	74	1.048		
82	52.070	82	0.468	75	1.048		
84	52.000	84	0.469	76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	0.518	60	0.00838	30	0.269
	N	70	0.687	70	0.01091	35	0.273
	S	80	0.903	80	0.01406	40	0.278
	O	90	1.174	90	0.01794	45	0.283
	L	100	1.512	100	0.02270	50	0.288
	U	110	1.930	110	0.02847	55	0.293
	B	120	2.444	120	0.03542	60	0.298
	L	130	3.069	130	0.04372	65	0.303
	E	140	3.825	140	0.05359	70	0.308
		150	4.732	150	0.06523	75	0.313
		160	5.816	160	0.07886	80	0.318
		170	7.100	170	0.09475	85	0.323
		180	8.614	180	0.11320	90	0.328
		190	10.390	190	0.13440	95	0.333
		200	12.460	200	0.15870	100	0.338
		210	14.860	210	0.18650	105	0.342
						110	0.347
						115	0.352
						120	0.357
						125	0.362
						130	0.367
						135	0.372
						140	0.377
						145	0.382
						150	0.387
						155	0.392

# BUTYLENE

BTN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Butene	Liquefied compressed gas    Colorless    Fragrant gasoline-like odor  Floats and boils on water. Flammable, visible vapor cloud is produced.
Restrict access. Evacuate. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Stop flow of gas if possible. Cool exposed containers and protect men effecting the shutoff with water. Let fire burn.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> If inhaled, will cause dizziness and difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Will cause frostbite. Flush affected areas with plenty of water. <b>DO NOT RUB AFFECTED AREAS.</b>
<b>Water Pollution</b>	Not harmful to aquatic life. May be dangerous if it enters water intakes. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 30; Olefin
- 2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$
- 2.3 IMO/IUN Designation: 2.0/1012
- 2.4 DOT ID No.: 1012
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 115
- 2.7 Standard Industrial Trade Classification: 51113

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical goggles, gloves, self-contained breathing apparatus or organic canister.
- 3.2 **Symptoms Following Exposure:** May act as an asphyxiant or slight anesthetic at high vapor concentrations. Vapor concentrations are not usually a hazard at room temperature except in enclosed spaces.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air and apply resuscitation. Call a doctor. EYES AND SKIN: flush with water for at least 15 minutes.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to the eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly. May cause frostbite.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent
- 4.2 **Flammable Limits in Air:** 1.6%-10%
- 4.3 **Fire Extinguishing Agents:** Stop flow of gas
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode in fire. Vapor is heavier than air and may travel long distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 725°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 8.8 mm/min.
- 4.10 **Adiabatic Flame Temperature:** 2493. (Est.)
- 4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 56.10
- 9.3 **Boiling Point at 1 atm:** 20.7°F = -6.3°C = 266.9°K
- 9.4 **Freezing Point:** -297°F = -183°C = 90°K
- 9.5 **Critical Temperature:** 295.5°F = 146.4°C = 419.6°K
- 9.6 **Critical Pressure:** 584 psia = 39.7 atm = 4.02 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.595 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 12.5 dynes/cm = 0.0125 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 68 dynes/cm = 0.068 N/m at 0°C
- 9.10 **Vapor (Gas) Specific Gravity:** 1.9
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.104
- 9.12 **Latent Heat of Vaporization:** 168 Btu/lb = 93.4 cal/g = 3.91 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -19,487 Btu/lb = -10,286 cal/g = -453.26 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 62.5 psia

### NOTES

# BUTYLENE

BTN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-110	44.060	-30	0.527		N	-120	0.496
-100	43.680	-20	0.533		O	-110	0.451
-90	43.290	-10	0.539		T	-100	0.412
-80	42.910	0	0.545			-90	0.378
-70	42.530	10	0.551		P	-80	0.348
-60	42.150	20	0.558		E	-70	0.323
-50	41.770				R	-60	0.300
-40	41.390				T	-50	0.280
-30	41.010				I	-40	0.262
-20	40.620				N	-30	0.246
-10	40.240				E	-20	0.231
0	39.860				N	-10	0.218
10	39.480				T	0	0.206
20	39.100					10	0.196
						20	0.186

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	0	9.248	0	0.10510	0	0.334
	N	5	10.390	5	0.11680	25	0.349
	S	10	11.640	10	0.12960	50	0.364
	O	15	13.020	15	0.14330	75	0.379
	L	20	14.520	20	0.15820	100	0.394
	U	25	16.160	25	0.17420	125	0.408
	B	30	17.940	30	0.19150	150	0.422
	L	35	19.880	35	0.21000	175	0.436
	E	40	21.980	40	0.22990	200	0.449
		45	24.260	45	0.25120	225	0.462
		50	26.720	50	0.27400	250	0.475
		55	29.380	55	0.29830	275	0.488
		60	32.240	60	0.32420	300	0.501
		65	35.320	65	0.35180	325	0.513
						350	0.525
						375	0.537
						400	0.548
						425	0.559
						450	0.570
						475	0.581
						500	0.592
						525	0.602
						550	0.612
						575	0.622
						600	0.632

# 1,2-BUTYLENE OXIDE

BTO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Butene oxide Butylene oxide Alpha-Butylene oxide 1,2-Epoxybutane	Liquid  Colorless  Sharp odor  Mixes with water.
<b>Restrict access.</b> <b>Evacuate.</b> <b>Shut off ignition sources. Call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Wear rubber overclothing (including gloves).</b> <b>Stay upwind. Use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	<b>FLAMMABLE:</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 16; Alkylene oxide  
**2.2 Formula:** C<sub>4</sub>H<sub>8</sub>CHCH<sub>2</sub>O  
**2.3 IMO/UN Designation:** Not listed  
**2.4 DOT ID No.:** 3022  
**2.5 CAS Registry No.:** 106-88-7  
**2.6 NAERG Guide No.:** 127P  
**2.7 Standard Industrial Trade Classification:** 51615

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Clean protective clothing; rubber gloves; chemical worker's goggles; self-contained breathing apparatus
- 3.2 Symptoms Following Exposure:** Inhalation: intolerable odor and irritation; respiratory injury may occur at higher levels. Ingestion causes irritation of mouth and stomach. Contact with either liquid or vapor may cause burns of eyes. Liquid produces frostbite-type of skin burn if free to evaporate; if confined to skin, burn may cause skin sensitization; not readily absorbed in toxic amounts.
- 3.3 Treatment of Exposure:** INHALATION: if any ill effects occur, immediately remove person to fresh air and get medical help; if breathing stops, start artificial respiration. INGESTION: induce vomiting promptly and get medical help. EYES: promptly flush with plenty of water for at least 15 min. and get medical help. SKIN: promptly flush with plenty of water; remove all contaminated clothing and wash before reuse.
- 3.4 TLV-TWA:** Not listed  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 1,410 mg/kg (rat)  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Currently not available  
**3.11 Liquid or Solid Characteristics:** Currently not available  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:**  
<-20°F O.C.
- 4.2 Flammable Limits in Air:** 1.5%-18.3%
- 4.3 Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 Special Hazards of Combustion Products:** Currently not available
- 4.6 Behavior in Fire:** Containers may explode in fire. Use water to cool container from safe distance.
- 4.7 Auto Ignition Temperature:** 959°F
- 4.8 Electrical Hazards:** Currently not available
- 4.9 Burning Rate:** Currently not available
- 4.10 Adiabatic Flame Temperature:** Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)
- 4.12 Flame Temperature:** Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** Exothermic polymerization.
- 5.2 Reactivity with Common Materials:** Incompatible with acids, bases, oxidizers, and water.
- 5.3 Stability During Transport:** Stable
- 5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 Polymerization:** May occur when in contact with strong acids or bases
- 5.6 Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
Currently not available
- 6.2 Waterfowl Toxicity:** Currently not available
- 6.3 Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 Food Chain Concentration Potential:**  
None
- 6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 1  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Technical, 99%
- 7.2 Storage Temperature:** Ambient
- 7.3 Inert Atmosphere:** No requirement
- 7.4 Venting:** Pressure-vacuum
- 7.5 IMO Pollution Category:** C
- 7.6 Ship Type:** 3
- 7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid
- 8.2 49 CFR Class:** 3
- 8.3 49 CFR Package Group:** II
- 8.4 Marine Pollutant:** No
- 8.5 NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 2              |
- 8.6 EPA Reportable Quantity:** 1000 pounds
- 8.7 EPA Pollution Category:** C
- 8.8 RCRA Waste Number:** U213
- 8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid
- 9.2 Molecular Weight:** 72
- 9.3 Boiling Point at 1 atm:** 145°F = 63°C = 336°K
- 9.4 Freezing Point:** <-58°F = <-50°C = <223°K
- 9.5 Critical Temperature:** Currently not available
- 9.6 Critical Pressure:** Currently not available
- 9.7 Specific Gravity:** 0.826 at 25°C (liquid)
- 9.8 Liquid Surface Tension:** Currently not available
- 9.9 Liquid Water Interfacial Tension:** Not pertinent
- 9.10 Vapor (Gas) Specific Gravity:** 2.49
- 9.11 Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 Latent Heat of Vaporization:** (est.) 180 Btu/lb = 100 cal/g = 4.2 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion:** -15,200 Btu/lb = -8,470 cal/g = -354 X 10<sup>5</sup> J/kg
- 9.14 Heat of Decomposition:** Not pertinent
- 9.15 Heat of Solution:** Not pertinent
- 9.16 Heat of Polymerization:** Currently not available
- 9.17 Heat of Fusion:** Currently not available
- 9.18 Limiting Value:** Currently not available
- 9.19 Reid Vapor Pressure:** 5.8 psia

### NOTES

# 1,2-BUTYLENE OXIDE

BTO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	52.430	N O T  P E R T I N E N T	N O T  P E R T I N E N T	N O T  P E R T I N E N T	N O T  P E R T I N E N T	52	0.458
54	52.360					54	0.453
56	52.290					56	0.448
58	52.220					58	0.443
60	52.150					60	0.438
62	52.080					62	0.433
64	52.010					64	0.428
66	51.940					66	0.423
68	51.870					68	0.419
70	51.800					70	0.414
72	51.730					72	0.410
74	51.660					74	0.405
76	51.600					76	0.401
78	51.530					78	0.397
80	51.460					80	0.393
82	51.390					82	0.388
84	51.320					84	0.384
86	51.250					86	0.381

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	7.000	55	3.099	55	0.04039	N O T  P E R T I N E N T	N O T  P E R T I N E N T
		60	3.425	60	0.04421		
		65	3.779	65	0.04831		
		70	4.161	70	0.05269		
		75	4.573	75	0.05737		
		80	5.017	80	0.06236		
		85	5.496	85	0.06768		
		90	6.010	90	0.07333		
		95	6.561	95	0.07934		
		100	7.151	100	0.08571		
		105	7.783	105	0.09245		
		110	8.459	110	0.09959		
		115	9.179	115	0.10710		
		120	9.947	120	0.11510		
		125	10.760	125	0.12350		
		130	11.630	130	0.13230		
		135	12.550	135	0.14160		
		140	13.530	140	0.15140		
		145	14.570	145	0.16160		
		150	15.670	150	0.17240		
		155	16.830	155	0.18360		

# P-TERT-BUTYLPHENOL

BTP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Solid  White  Disinfectant-like odor  May float or sink in water.
Restrict access. Avoid contact with solid and dust. Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge  
Chemical and Physical Treatment: Burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: 1, 4-(CH<sub>3</sub>)<sub>2</sub>CC<sub>6</sub>H<sub>4</sub>OH
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 98-54-4
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51243

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical workers' goggles; clean, body-protecting clothing
- 3.2 **Symptoms Following Exposure:** Inhalation of vapors causes irritation of respiratory system. Ingestion causes irritation of mouth and stomach. Contact with eyes causes burns. Contact with dry skin produces no significant irritation, but wet skin is subject to moderate irritation, even a mild burn.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air; begin artificial respiration if breathing has ceased. INGESTION: force milk or water and then immediately induce vomiting; treat symptomatically. EYES: immediately flush eyes with plenty of water for at least 15 min., get medical attention promptly. SKIN: flush with plenty of water; remove grossly contaminated clothing.
- 3.4 **TLV-TWA:** 1.0 ppm.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 3,250 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 100 ppm.
- 3.14 **OSHA PEL-TWA:** 10 ppm.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 235°F C.C. (liquid)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 61.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 17.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: T
  - Damage to living resources: 3
  - Human Oral hazard: 1
  - Human Contact hazard: II
  - Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 98.5%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 150
- 9.3 **Boiling Point at 1 atm:** 463.1°F = 239.5°C = 512.7°C
- 9.4 **Freezing Point:** 210°F = 99°C = 372°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.037 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -16,900 Btu/lb = -9,410 cal/g = -394 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# P-TERT-BUTYLPHENOL

BTP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.001		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# N-BUTYRALDEHYDE

BTR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butaldehyde Butanal Butylaldehyde Butyl aldehyde Butyraldehyde Butyric aldehyde	Watery liquid  Colorless  Pungent odor  Floats and mixes slowly with water. Flammable, irritating vapor is produced.
<b>Restrict access.</b> <b>Avoid contact with liquid and vapor.</b> <b>Wear goggles and self-contained breathing apparatus.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin. Will burn eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 19; Aldehyde  
2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$   
2.3 IMO/UN Designation: 3.2/1129  
2.4 DOT ID No.: 1129  
2.5 CAS Registry No.: 123-72-8  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Protective goggles, gloves, and organic canister gas mask.  
3.2 **Symptoms Following Exposure:** Inhalation will cause irritation and possibly nausea, vomiting, headache, and loss of consciousness. Contact with eyes causes burns. Skin contact may be irritating.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if breathing has stopped, give artificial respiration; if breathing is difficult, give oxygen; call a doctor at once. SKIN AND EYES: immediately flush with water for at least 15 min.; get medical care for eyes; remove contaminated clothing and wash underlying skin.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1;  $\text{LD}_{50}$  = 5-15 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.0046 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 15°F O.C. 20°F C.C.  
4.2 **Flammable Limits in Air:** 2.5%-10.6%  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back. Fires are difficult to control due to ease of reignition.  
4.7 **Auto Ignition Temperature:** 446°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4.4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** None  
5.2 **Reactivity with Common Materials:** None  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** May occur in presence of heat, acids, or alkalis  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 1.62 lb/lb, 5 days; 106%, 5 days (theor.)  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Water saturated: 97%; dry: 99.5%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 72.11  
9.3 **Boiling Point at 1 atm:** 167°F = 74.8°C = 348.0°K  
9.4 **Freezing Point:** -142°F = -96.4°C = 176.8°K  
9.5 **Critical Temperature:** 483.8°F = 251°C = 524.2°K  
9.6 **Critical Pressure:** 590 psia = 40 atm = 4.1 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.803 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 24.6 dynes/cm = 0.0246 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 5.7 dynes/cm = 0.0057 N/m at 22.3°C  
9.10 **Vapor (Gas) Specific Gravity:** 2.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.089  
9.12 **Latent Heat of Vaporization:** 184 Btu/lb = 102 cal/g = 4.27 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -15,210 Btu/lb = -8450 cal/g = -353.8 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 4.8 psia

### NOTES



# N-BUTYRALDEHYDE

BTR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	51.320	-55	0.486	30	1.077	-35	0.839
40	51.130	-50	0.487	35	1.072	-30	0.805
45	50.940	-45	0.489	40	1.066	-25	0.773
50	50.750	-40	0.490	45	1.060	-20	0.743
55	50.560	-35	0.491	50	1.054	-15	0.715
60	50.370	-30	0.493	55	1.048	-10	0.688
65	50.180	-25	0.494	60	1.042	-5	0.663
70	49.990	-20	0.495	65	1.036	0	0.640
75	49.800	-15	0.497	70	1.031	5	0.618
80	49.610	-10	0.498	75	1.025	10	0.597
85	49.410	-5	0.500	80	1.019	15	0.577
90	49.220	0	0.501	85	1.013	20	0.558
95	49.030	5	0.502	90	1.007	25	0.540
100	48.840	10	0.504	95	1.001	30	0.523
105	48.650	15	0.505	100	0.995	35	0.507
110	48.460	20	0.507	105	0.989	40	0.492
115	48.270	25	0.508	110	0.983	45	0.478
120	48.080	30	0.509	115	0.978	50	0.464
125	47.890	35	0.511	120	0.972	55	0.451
130	47.700	40	0.512	125	0.966	60	0.438
135	47.510	45	0.514	130	0.960	65	0.426
140	47.320	50	0.515	135	0.954	70	0.415
		55	0.516	140	0.948	75	0.404
		60	0.518			80	0.393
		65	0.519			85	0.383
		70	0.520			90	0.374

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	7.100	0	0.378	0	0.00553	0	0.304
		10	0.527	10	0.00754	25	0.316
		20	0.723	20	0.01013	50	0.328
		30	0.977	30	0.01340	75	0.340
		40	1.301	40	0.01749	100	0.351
		50	1.710	50	0.02254	125	0.362
		60	2.221	60	0.02870	150	0.374
		70	2.851	70	0.03615	175	0.384
		80	3.620	80	0.04506	200	0.395
		90	4.552	90	0.05563	225	0.406
		100	5.670	100	0.06806	250	0.416
		110	7.001	110	0.08256	275	0.426
		120	8.573	120	0.09935	300	0.436
		130	10.420	130	0.11860	325	0.446
		140	12.560	140	0.14070	350	0.456
		150	15.040	150	0.16570	375	0.466
		160	17.900	160	0.19400	400	0.475
		170	21.160	170	0.22570	425	0.484
		180	24.870	180	0.26120	450	0.493
		190	29.070	190	0.30060	475	0.502
		200	33.800	200	0.34420	500	0.511
		210	39.100	210	0.39220	525	0.519
						550	0.528
						575	0.536
						600	0.544

# TERT-BUTYLAMINE

BUA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Aminoisobutane 2-Amino-2-methylpropane 1,1-Dimethylethylamine TBA Trimethylaminomethane	Liquid  Colorless  Ammonia-like odor  Floats and mixes with water. Flammable, irritating vapor is produced.
<b>Restrict access.</b> <b>Evacuate.</b> Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** T; Aliphatic amine  
2.2 **Formula:** (CH<sub>3</sub>)<sub>3</sub>CNH<sub>2</sub>  
2.3 **IMO/UN Designation:** 3.2/1993  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 75-64-9  
2.6 **NAERG Guide No.:** Not listed.  
2.7 **Standard Industrial Trade Classification:** 51489

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose, mouth, and lungs. Ingestion causes irritation of mouth and stomach. Contact with liquid causes severe irritation of eyes and moderate irritation of skin.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air; give artificial respiration if breathing has stopped. INGESTION: give large amounts of water and induce vomiting. EYES: immediately flush with water for at least 15 min.; get medical attention. SKIN: flush with water; wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 180 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 16°F C.C.  
4.2 **Flammable Limits in Air:** 1.7%-8.9% (at 212°F)  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 716°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 7mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 36.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Liquid will attack some forms of plastics.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 73.14  
9.3 **Boiling Point at 1 atm:** 113°F = 45°C = 318°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.696 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 19 dynes/cm = 0.019 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 8.13  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 167.0 Btu/lb = 92.8 cal/g = 3.88 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -17,600 Btu/lb = -9,790 cal/g = -410 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** -170 Btu/lb = -96 cal/g = -4.0 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 11 psia

### NOTES

# TERT-BUTYLAMINE

BUA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	44.000	76	0.621		N O T  P E R T I N E N T		N O T  P E R T I N E N T
54	43.930						
56	43.860						
58	43.790						
60	43.720						
62	43.650						
64	43.580						
66	43.520						
68	43.450						
70	43.380						
72	43.310						
74	43.240						
76	43.170						
78	43.100						
80	43.030						
82	42.960						
84	42.890						
86	42.820						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		100	12.140	100	0.14770		N O T  P E R T I N E N T
		120	17.760	120	0.20880		
		140	25.280	140	0.28720		
		160	35.100	160	0.38600		
		180	47.670	180	0.50780		
		200	63.450	200	0.65530		
		220	82.929	220	0.83140		
		240	106.599	240	1.03800		
		260	135.099	260	1.27900		
		280	168.699	280	1.55400		
		300	208.199	300	1.86700		
		320	253.900	320	2.21900		
		340	306.399	340	2.61100		
		360	366.199	360	3.04400		
		380	433.699	380	3.51900		
		400	509.299	400	4.03700		

# BUTYL BUTYRATE

BUB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butanoic acid, butyl ester Butyl butanoate Butyric acid, butyl ester	Liquid  Colorless  Ester odor  Floats on water.
<b>Shut off ignition sources. Call fire department. Avoid contact with liquid and vapor. Keep people away. Stop discharge if possible. Stay upwind. Use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	COMBUSTIBLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective on fire. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause headache or dizziness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea, vomiting, dizziness, or headache. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $C_8H_{16}O_2$   
2.3 IMO/UN Designation: Not Listed  
2.4 DOT ID No.: Not Listed  
2.5 CAS Registry No.: 109-21-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** All-purpose canister mask or chemical cartridge respirator; glass or face
- 3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, dizziness, nausea, vomiting, and narcosis. Contact with liquid irritates eyes.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air and call a physician; give artificial respiration if necessary. INGESTION: Induce vomiting and call a physician. EYES: Flush with water for at least 15 minutes. SKIN: Flush with water; wash with soap and water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1;  $LD_{50} = 9.5$  g/kg (rbt)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 128°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May attack some forms of plastics  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: (2)  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not Listed  
8.2 49 CFR Class: Not Pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 144.21  
9.3 **Boiling Point at 1 atm:** 332°F = 166.6°C = 440°K  
9.4 **Freezing Point:** -133°F = -91.5°C = 182°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.872 @ 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.97  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 195.9 Btu/lb = 108.8 cal/g = 4.56 x 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.2 psia

### NOTES

# BUTYL BUTYRATE

BUB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	54.310		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.302 0.312 0.322 0.332 0.342 0.352 0.362 0.372 0.382 0.392 0.403 0.413 0.423 0.433 0.443 0.453 0.463 0.473 0.483 0.493 0.503 0.513 0.523 0.533 0.543

# BUTYRYL CHLORIDE

BUC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butanoyl chloride Butyrol chloride n-Butyryl chloride	Liquid  Colorless  Sharp odor  Sinks in water.
Avoid contact with liquid and vapor. Keep people away. Wear self-contained breathing apparatus and full protective clothing. Shut off sources of ignition. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE Emits toxic fumes of hydrogen chloride when heated. Containers may explode in fire. Flashback may occur along vapor trail. Extinguish with dry chemical or CO <sub>2</sub> . DO NOT USE WATER OR FOAM TO EXTINGUISH FIRE.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR Highly irritating to skin, eyes, and mucous membranes. Harmful if inhaled or absorbed through the skin. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed or absorbed through the skin. Corrosive to the skin and eyes IF IN EYES: hold eyelids open, flush with water for at least 15 minutes. Remove contaminated clothing and shoes, flush affected areas with water. IF SWALLOWED: do nothing except keep victim warm. DO NOT INDUCE VOMITING
<b>Water Pollution</b>	Effect of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes. Dilute and disperse Do not burn

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: C<sub>4</sub>H<sub>7</sub>ClO
- 2.3 IMO/UN Designation: 3.2/2353
- 2.4 DOT ID No.: 2353
- 2.5 CAS Registry No.: 141-75-3
- 2.6 NAERG Guide No.: 132
- 2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, chemical-resistant gloves, safety goggles, other protective clothing.
- 3.2 **Symptoms Following Exposure:** Extremely destructive to the mucous membranes, upper respiratory tract, eyes, and skin. Inhalation may cause death as a result of spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.
- 3.3 **Treatment of Exposure:** Call a physician. EYES: Hold eyelids open and flush with water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes, flush affected areas with water for at least 15 minutes. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Do nothing except keep victim warm. DO NOT INDUCE VOMITING.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of the eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 71°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** CO<sub>2</sub>, dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water or foam to extinguish fire.
- 4.5 **Special Hazards of Combustion Products:** Emits toxic fumes of chlorine gas
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 23.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Decomposes to produce hydrogen chloride gas, which may react with metals to produce explosive hydrogen gas.
- 5.2 **Reactivity with Common Materials:** Corrosive to metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Sodium carbonate, slaked lime, soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** None
- 7.4 **Venting:** None
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 106.51
- 9.3 **Boiling Point at 1 atm:** 216°F = 102°C = 375°K
- 9.4 **Freezing Point:** -128°F = -89°C = 184°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.0277 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 3.67
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BUTYRYL CHLORIDE

BUC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	64.170		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.240 0.247 0.254 0.261 0.268 0.275 0.281 0.288 0.295 0.302 0.309 0.316 0.323 0.330 0.337 0.343 0.350 0.357 0.364 0.371 0.378 0.385 0.392 0.399 0.405

# 1,4-BUTENEDIOL

BUD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Butene-1, 4-diol cis-2-Butene-1, 4-diol 1,4-Dihydroxy-2-butene	Thick liquid Light yellow Odorless  Sinks and mixes with water. Freezing point is 45°F.
Call fire department. avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{HOCH}_2\text{CH}_2\text{CHCH}_2\text{OH}$
- 2.3 IMO/UN Designation: 3.3/1987
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 110-64-5
- 2.6 NAERG Guide No.: Not listed.
- 2.7 Standard Industrial Trade Classification: 51229

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Eye protection
- 3.2 Symptoms Following Exposure: Currently not available
- 3.3 Treatment of Exposure: SKIN OR EYE CONTACT: flush well with water. Consult physician in cases of skin irritation, eye contact, or accidental ingestion.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent
- 3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 263°F O.C.
- 4.2 Flammable Limits in Air: Not pertinent
- 4.3 Fire Extinguishing Agents: Alcohol foam, dry chemical or carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Foam or water may cause frothing.
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 23.8 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 8.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Stable
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 95%
- 7.2 Storage Temperature: Above 45°F
- 7.3 Inert Atmosphere: Inerted
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 88.11
- 9.3 Boiling Point at 1 atm: 453°F = 234°C = 507°K
- 9.4 Freezing Point: 45°F = 7°C = 280°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.07 at 25°C (liquid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: (est.) -10,8000 Btu/lb = -5980 cal/g = -250 X 10<sup>5</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: (est.) 9 Btu/lb = 5 cal/g = 0.2 X 10<sup>5</sup> J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES



# 1,4-BUTENEDIOL

BUD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	67.379	85	0.565		N		N
61	67.349	90	0.570		O		O
62	67.309	95	0.574		T		T
63	67.280	100	0.579				
64	67.240	105	0.584		P		P
65	67.209	110	0.589		E		E
66	67.169	115	0.594		R		R
67	67.139	120	0.599		T		T
68	67.099	125	0.604		I		I
69	67.070	130	0.608		N		N
70	67.030	135	0.613		E		E
71	67.000	140	0.618		N		N
72	66.969	145	0.623		T		T
73	66.929	150	0.628				
74	66.900						
75	66.860						
76	66.830						
77	66.790						
78	66.759						
79	66.719						
80	66.690						
81	66.650						
82	66.620						
83	66.580						
84	66.549						
85	66.509						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	75	0.000	75	0.00000		N
	I	80	0.000	80	0.00000		O
	S	85	0.000	85	0.00000		T
	C	90	0.000	90	0.00000		
	I	95	0.000	95	0.00001		P
	B	100	0.001	100	0.00001		E
	L	105	0.001	105	0.00001		R
	E	110	0.001	110	0.00001		T
		115	0.001	115	0.00002		I
		120	0.001	120	0.00002		N
		125	0.002	125	0.00002		E
		130	0.002	130	0.00003		N
		135	0.003	135	0.00004		T
		140	0.003	140	0.00004		
		145	0.004	145	0.00005		
		150	0.005	150	0.00007		

# BUTYL TOLUENE

BUE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 4-tert-Butyltoluene p-tert-Butyltoluene p-Methyl-tert-butylbenzene 1-Methyl-4-tert-butylbenzene TBT Toluene, p-tert-butyl	Liquid  Colorless  Aromatic gasoline-like odor
Restrict access. Call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Water may be ineffective on fire. Wear self-contained breathing apparatus and protective clothing. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to skin, eyes, and respiratory tract. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. IF IN EYES, hold eyelids open and flush with plenty of water.  LIQUID Irritating to skin, eyes, and respiratory tract. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, do not induce vomiting.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 32; Aromatic hydrocarbons  
**2.2 Formula:** (CH<sub>3</sub>)C<sub>6</sub>H<sub>4</sub>(C<sub>4</sub>H<sub>9</sub>)  
**2.3 IMO/UN Designation:** 6.1/2667  
**2.4 DOT ID No.:** 2667  
**2.5 CAS Registry No.:** 98-51-1  
**2.6 NAERG Guide No.:** 131  
**2.7 Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Chemical safety goggles, compatible chemical resistant gloves, approved respirator.  
**3.2 Symptoms Following Exposure:** May be harmful by inhalation, ingestion or skin absorption. Vapor or mist is irritating to the eyes, mucous membrane, upper respiratory tract and skin. May cause headache, tachycardia, abnormal cardiovascular system behavior, central nervous system depression, and hematopoietic depression.  
**3.3 Treatment of Exposure:** INHALATION: Call for medical aid. Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Do not induce vomiting. EYES: Flush with copious amounts of water for at least 15 minutes. SKIN: Wash with soap and copious amounts of water.  
**3.4 TLV-TWA:** 1 ppm (as p-tert isomer)  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.9g/kg (mouse)  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** 100 ppm (as p-tert isomer)  
**3.14 OSHA PEL-TWA:** 10 ppm (as p-tert isomer)  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 130°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Water sprays, carbon dioxide, dry chemical, alcohol foam.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Currently not available  
**4.5 Special Hazards of Combustion Products:** Currently not available  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 71.4 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 19.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction.  
**5.2 Reactivity with Common Materials:** No reaction.  
**5.3 Stability During Transport:** Stable.  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent.  
**5.5 Polymerization:** Will not occur.  
**5.6 Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
 Bioaccumulation: T  
 Damage to living resources: 3  
 Human Oral hazard: 1  
 Human Contact hazard: I  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Currently not available  
**7.2 Storage Temperature:** Currently not available  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** A  
**7.6 Ship Type:** 2  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Keep Away From Food  
**8.2 49 CFR Class:** 6.1  
**8.3 49 CFR Package Group:** III  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 148.25  
**9.3 Boiling Point at 1 atm:** 372.2-377.6°F = 189-192°C = 462.2-465.2°K  
**9.4 Freezing Point:** -79.6°F = -62°C = 211.2°K  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 0.853  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** 5.11  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# BUTYL TOLUENE

BUE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	68	0.019		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.270 0.286 0.302 0.318 0.333 0.348 0.362 0.377 0.391 0.404 0.418 0.431 0.444 0.457 0.470 0.482 0.494 0.506 0.518 0.529 0.540 0.551 0.562 0.572 0.583

# N-VALERALDEHYDE

BUF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Amyl aldehyde Valeric aldehyde Pentanal n-Butyl formal	Watery liquid      Colorless      Fruity odor  Floats on water. Flammable, irritating vapor is produced.
<b>Restrict access. Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with alcohol foam, dry chemical, or carbon dioxide. Water may be ineffective on fires. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. Move to fresh air.  LIQUID Irritating to skin and eyes. Flush affected areas with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 19; Aldehydes  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_4\text{CHO}$   
2.3 IMO/UN Designation: 3.2/2058  
2.4 DOT ID No.: 2058  
2.5 CAS Registry No.: 110-62-3  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves and boots.  
3.2 **Symptoms Following Exposure:** Vapor may irritate eyes. Liquid irritates eyes and skin.  
3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.  
3.4 **TLV-TWA:** 50 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1;  $\text{LD}_{50} = 3.2 \text{ g/kg}$  (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 54°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 1.9 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 26% (theor.), 5 days.  
6.4 **Food Chain Concentration Potential:** None.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 98.5+%  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Pressure vacuum valve.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable Liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 86.13  
9.3 **Boiling Point at 1 atm:** 217.4°F = 103.0°C = 376.2°K  
9.4 **Freezing Point:** -132°F = -91°C = 182°K  
9.5 **Critical Temperature:** 537.8°F = 281°C = 554.2°K  
9.6 **Critical Pressure:** 514 psia = 35 atm = 3.5 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.811 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.072  
9.12 **Latent Heat of Vaporization:** 170 Btu/lb = 93 cal/g =  $3.9 \times 10^5 \text{ J/kg}$   
9.13 **Heat of Combustion:** -15,500 Btu/lb = -8,610 cal/g =  $-360.5 \times 10^3 \text{ J/kg}$   
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

NOTES

# N-VALERALDEHYDE

BUF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	6.768		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# BUTYLENE GLYCOL

BUG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butanediol Dihydroxybutane		Liquid or Solid (depending upon temperature)	Colorless	Odorless
Call fire department. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin or eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohols, glycols  
2.2 Formula:  $\text{HOCH}_2(\text{CH}_2)_2\text{CH}_2\text{OH}$  (1,4-)  
2.3 IMO/UN Designation: 3.3/1987 (1,4-)  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 110-63-4 (1,4-) 107-88-0 (1,3-) 513-85-9 (2,3-)  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51229

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Eye protection and rubber gloves.  
3.2 Symptoms Following Exposure: Ingestion of large amounts needed to produce any symptoms.  
3.3 Treatment of Exposure: SKIN OR EYES: wash off immediately with plenty of water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5$  to  $5 \text{ g/kg}$  (rat) (1,4-) Grade 1;  $\text{LD}_{50} = 23 \text{ g/kg}$  (rat) (1,3-) Grade 2;  $\text{LD}_{50} = 5.462 \text{ g/kg}$  (mouse) (2,3-)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None.  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to eyes and throat.  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
3.12 Odor Threshold: Odorless.  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:  $185 - 311^\circ\text{F}$  O.C.  
4.2 Flammable Limits in Air: Lel: 1.9%  
4.3 Fire Extinguishing Agents: Alcohol foam, dry chemical or carbon dioxide.  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Carbon dioxide and carbon monoxide may be produced in fire.  
4.6 Behavior in Fire: Unstable with heat; may form flammable tetrahydrofuran at  $300^\circ\text{F}$ .  
4.7 Auto Ignition Temperature:  $671^\circ\text{F}$  (1,4-)  
4.8 Electrical Hazards: Not listed.  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 26.2 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 9.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Regular and anhydrous grades; technical.  
7.2 Storage Temperature: Ambient.  
7.3 Inert Atmosphere: No requirement.  
7.4 Venting: Not listed.  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.  
8.2 49 CFR Class: Not pertinent.  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  
Category Classification  
Health Hazard (Blue)..... 1  
Flammability (Red)..... 2  
Instability (Yellow)..... -  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCL List: Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.  
5.2 Reactivity with Common Materials: Incompatible with strong acids and strong oxidizers.  
5.3 Stability During Transport: Stable.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.  
5.5 Polymerization: Will not polymerize.  
5.6 Inhibitor of Polymerization: Not pertinent.

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at  $15^\circ\text{C}$  and 1 atm: Solid or liquid  
9.2 Molecular Weight: 90.12  
9.3 Boiling Point at 1 atm:  $442^\circ\text{F} = 228^\circ\text{C} = 501^\circ\text{K}$  (1,4-)  $406^\circ\text{F} = 207.5^\circ\text{C} = 480.5^\circ\text{K}$  (1,3-)  $356^\circ\text{F} = 180^\circ\text{C} = 453^\circ\text{K}$  (2,3-)  
9.4 Freezing Point:  $66 - 68^\circ\text{F} = 18.9 - 20^\circ\text{C} = 291.9 - 293^\circ\text{K}$  (1,4-)  $-58^\circ\text{F} = -50^\circ\text{C} = 223^\circ\text{K}$  (1,3-)  $66^\circ\text{F} = 19^\circ\text{C} = 292^\circ\text{K}$  (2,3-)  
9.5 Critical Temperature:  $716^\circ\text{F} = 380^\circ\text{C} = 653^\circ\text{K}$  (1,4-)  
9.6 Critical Pressure: 720 psia = 49 atm =  $5.0 \text{ MN/m}^2$  (1,4-)  
9.7 Specific Gravity: 1.017 at  $20^\circ\text{C}$  (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 3.2  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: (est.) (1,4-)  $-11,900 \text{ Btu/lb} = -6630 \text{ cal/g} = -277 \times 10^3 \text{ J/kg}$   
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent.  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None.  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0/BOD  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

NOTES

# BUTYLENE GLYCOL

BUG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	8.430		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	68	0.003	68	0.00005		C U R R E N T L Y  N O T  A V A I L A B L E

# BUTANE

BUT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Butane		Liquefied compressed gas Colorless Gasoline-like odor
Restrict access. Evacuate. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.		Floats and boils on water. Flammable, visible vapor cloud is formed.
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Stop flow of gas if possible. Cool exposed containers and protect men effecting shut-off with water. Let fire burn.	
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b> <b>VAPOR</b> If inhaled, will cause dizziness or difficult breathing. Not irritating to eyes, nose or throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. <b>LIQUID</b> Will cause frostbite. Flush affected areas with plenty of water. <b>DO NOT RUB AFFECTED AREAS.</b>	
<b>Water Pollution</b>	Not harmful to aquatic life. May be dangerous if it enters water intakes. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 31; Paraffin  
 2.2 Formula: n-C<sub>4</sub>H<sub>10</sub>  
 2.3 IMO/UN Designation: 2.0/1011  
 2.4 DOT ID No.: 1011  
 2.5 CAS Registry No.: 106-97-8  
 2.6 NAERG Guide No.: 115  
 2.7 Standard Industrial Trade Classification: 51114

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Self-contained breathing apparatus and safety goggles.  
**3.2 Symptoms Following Exposure:** High exposure produces drowsiness but no other evidence of systemic effect.  
**3.3 Treatment of Exposure:** ORAL AND ASPIRATION: No treatment required. INHALATION: Guard against self-injury if stuporous, confused, or anesthetized. Apply artificial respiration if not breathing. Avoid administration of epinephrine or other sympathomimetic amines. Prevent aspirations of vomitus by proper positioning of the head. Give symptomatic and supportive treatment.  
**3.4 TLV-TWA:** 800 ppm  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Not pertinent  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** None  
**3.10 Vapor (Gas) Irritant Characteristics:** None  
**3.11 Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly from the skin. Some frostbite possible.  
**3.12 Odor Threshold:** 6.16 ppm  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** -76°F C.C.  
**4.2 Flammable Limits in Air:** 1.8%-8.4%  
**4.3 Fire Extinguishing Agents:** Stop flow of gas  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Not pertinent  
**4.7 Auto Ignition Temperature:** 550°F  
**4.8 Electrical Hazards:** Class 1, Group D  
**4.9 Burning Rate:** 7.9 mm/min.  
**4.10 Adiabatic Flame Temperature:** 2435. (Est.)  
**4.11 Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** None  
**6.2 Waterfowl Toxicity:** None  
**6.3 Biological Oxygen Demand (BOD):** None  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:** Not listed.

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Research: 99.95%; Pure: 99.4%; Technical: 97.6%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Safety relief  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** 2  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable gas  
**8.2 49 CFR Class:** 2.1  
**8.3 49 CFR Package Group:** Not pertinent  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Gas  
**9.2 Molecular Weight:** 58.12  
**9.3 Boiling Point at 1 atm:** 31.1°F = -0.48°C = 272.72°K  
**9.4 Freezing Point:** -216°F = -138°C = 135°K  
**9.5 Critical Temperature:** 305.6°F = 152°C = 425.2°K  
**9.6 Critical Pressure:** 550.8 psia = 37.47 atm = 3.796 MN/m<sup>2</sup>  
**9.7 Specific Gravity:** 0.60 at 0°C (liquid)  
**9.8 Liquid Surface Tension:** 14.7 dynes/cm = .0147 N/m at 0°C  
**9.9 Liquid Water Interfacial Tension:** (est.) 65 dynes/cm = 0.065 N/m at 22°C  
**9.10 Vapor (Gas) Specific Gravity:** 2 at 20°C  
**9.11 Ratio of Specific Heats of Vapor (Gas):** 1.092  
**9.12 Latent Heat of Vaporization:** 170 Btu/lb = 92 cal/g = 3.9 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -19,512 Btu/lb = -10,840 cal/g = -453.85 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** 19.18 cal/g  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 52.4 psia

### NOTES



# BUTANE

BUT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-110	41.940	-30	0.535		N	-110	0.535
-100	41.630	-20	0.542		O	-105	0.511
-90	41.320	-10	0.550		T	-100	0.489
-80	41.000	0	0.557			-95	0.468
-70	40.690	10	0.564		P	-90	0.449
-60	40.380	20	0.571		E	-85	0.431
-50	40.070	30	0.578		R	-80	0.414
-40	39.750				T	-75	0.398
-30	39.440				I	-70	0.383
-20	39.130				N	-65	0.369
-10	38.820				E	-60	0.356
0	38.510				N	-55	0.344
10	38.190				T	-50	0.332
20	37.880					-45	0.321
30	37.570					-40	0.311
						-35	0.301
						-30	0.292
						-25	0.283
						-20	0.275
						-15	0.267
						-10	0.260
						-5	0.253
						0	0.246
						5	0.239
						10	0.233
						15	0.227

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	-90	0.420	-90	0.00616	0	0.360
	N	-80	0.624	-80	0.00890	25	0.377
	S	-70	0.905	-70	0.01257	50	0.392
	O	-60	1.283	-60	0.01739	75	0.408
	L	-50	1.784	-50	0.02358	100	0.424
	U	-40	2.435	-40	0.03142	125	0.439
	B	-30	3.269	-30	0.04119	150	0.454
	L	-20	4.320	-20	0.05320	175	0.468
	E	-10	5.629	-10	0.06778	200	0.483
		0	7.237	0	0.08525	225	0.497
		10	9.192	10	0.10600	250	0.511
		20	11.540	20	0.13030	275	0.525
		30	14.340	30	0.15860	300	0.539
		40	17.640	40	0.19120	325	0.552
		50	21.510	50	0.22850	350	0.565
		60	25.990	60	0.27080	375	0.578
		70	31.160	70	0.31850	400	0.591
		80	37.080	80	0.37200	425	0.603
						450	0.615
						475	0.628
						500	0.639
						525	0.651
						550	0.663
						575	0.674
						600	0.685

# TERT-BUTYL ACETATE

BYA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, tert-butyl ester	Liquid	Colorless	Mild
Floats on water. Flammable, irritating vapor is produced.			
Restrict access. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. If inhaled will cause nausea, headache, or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control authorities. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $\text{CH}_3\text{COOC}(\text{CH}_3)_3$ ;  $\text{C}_6\text{H}_{12}\text{O}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 1123  
2.5 CAS Registry No.: 540-88-5  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Organic vapor canister or air-supplied mask; chemical goggles or face splash shield.  
3.2 **Symptoms Following Exposure:** INHALATION: Irritation of throat. EYES: Irritation.  
3.3 **Treatment of Exposure:** Currently not available  
3.4 **TLV-TWA:** 200 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Minor allergen and irritant.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of eyes or respiratory system, if present in high concentrations the effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Detection in water 4 ppb.  
3.13 **IDLH Value:** 1,500 ppm  
3.14 **OSHA PEL-TWA:** 200 ppm.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Alcohol foam,  $\text{CO}_2$ , dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** Currently not available  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Currently not available  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 116.16  
9.3 **Boiling Point at 1 atm:** 208°F = 97.8°C = 370.8°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.8665 at 20°C; 0.8593 at 25°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TERT-BUTYL ACETATE

BYA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	54.075		C		C		C
69	54.032		U		U		U
70	53.989		R		R		R
71	53.948		R		R		R
72	53.909		E		E		E
73	53.870		N		N		N
74	53.832		T		T		T
75	53.796		L		L		L
76	53.760		Y		Y		Y
77	53.725		N		N		N
			O		O		O
			T		T		T
			A		A		A
			V		V		V
			A		A		A
			I		I		I
			L		L		L
			A		A		A
			B		B		B
			L		L		L
			E		E		E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I		C		C		C
	N		U		U		U
	S		R		R		R
	O		R		R		R
	L		E		E		E
	U		N		N		N
	B		O		O		O
	L		T		T		T
	E		A		A		A
			V		V		V
			A		A		A
			I		I		I
			L		L		L
			A		A		A
			B		B		B
			L		L		L
			E		E		E

# BUTYL CHLORIDE

BYC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Butyl chloride 1-Chlorobutane NCI-C06155 n-Propylcarbonyl chloride	Liquid  Colorless  Characteristic chlorine odor  Floats on water.
Avoid contact with liquid and vapor. Keep people away. Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off sources of ignition. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE Poison gas is produced when heated. Containers may explode in fire. Water may be ineffective against fire. Wear self-contained positive pressure breathing apparatus and full protective clothing. Use water spray to cool exposed containers. Extinguish with CO <sub>2</sub> , dry chemical, or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be harmful if inhaled or absorbed through the skin. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID May be harmful if swallowed or absorbed through the skin. IF IN EYES: Immediately flush with plenty of water for 15 minutes. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>4</sub> H <sub>9</sub> Cl 2.3 IMO/UN Designation: 3.2/1127 2.4 DOT ID No.: 1127 2.5 CAS Registry No.: 109-69-3 2.6 NAERG Guide No.: 130 2.7 Standard Industrial Trade Classification: 51136
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Approved respirator, chemical safety goggles, rubber gloves, other protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Mildly irritating to the skin and eyes, liquid may cause rash due to removal of skin oils. Ingestion or skin absorption may cause intestinal upset, cramping, and central nervous system depression. 3.3 <b>Treatment of Exposure:</b> Call a physician. EYES: Flush with water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes, flush affected areas with water. Wash with soap and water. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: If victim is conscious, have victim drink water or milk and have victim induce vomiting. If victim is unconscious or having convulsions, do nothing except keep victim warm. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 2.67 g/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 14°F C.C.  
4.2 **Flammable Limits in Air:** 1.8-10.1%  
4.3 **Fire Extinguishing Agents:** Foam, CO<sub>2</sub>, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective against fire.  
4.5 **Special Hazards of Combustion Products:** May produce phosgene gas in fire  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 860°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Air, metals, oxidizers, and alkalis.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: Z  
Damage to living resources: -  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.5+%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** None  
7.4 **Venting:** None  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 92.58  
9.3 **Boiling Point at 1 atm:** 173°F = 78.4°C = 352°K  
9.4 **Freezing Point:** -190°F = -123°C = 150°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.8862 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.20  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 3.6 psia

## NOTES

# BUTYL CHLORIDE

BYC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	55.320		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	59	0.469

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
54	0.070	-50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150	0.040 0.053 0.070 0.093 0.123 0.163 0.217 0.288 0.382 0.507 0.673 0.893 1.185 1.572 2.087 2.770 3.676 4.879 6.476 8.595 11.408		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.270 0.279 0.287 0.295 0.303 0.311 0.319 0.327 0.335 0.344 0.352 0.360 0.368 0.376 0.384 0.392 0.400 0.408 0.417 0.425 0.433 0.441 0.449 0.457 0.465

# BENZOIC ACID

BZA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzenecarboxylic acid Carboxybenzene Dracrylic acid	Solid crystals or powder  White  Faint pleasant odor  Sinks in water.
Keep people away. Avoid contact with solid and dust. Wear goggles and self-contained breathing apparatus. Stay upwind and use water spray to "knock down" dust. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Vapor may explode if ignited in an enclosed area. Dust may form explosive mixture with air. Extinguish with water, dry chemical, chemical foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to nose and throat if inhaled. Move to fresh air.  SOLID Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C6H5COOH  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 65-85-0  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Bureau of Mines dust respirator; when melted material present, use eye protection and organic respirator for fumes.
- 3.2 **Symptoms Following Exposure:** Dust may be irritating to nose and eyes. At elevated temperatures, fumes may cause irritation of eyes, respiratory system, and skin.
- 3.3 **Treatment of Exposure:** Remove patient to fresh air. EYE CONTACT: flush eyes with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. Dust may irritate nose and eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 250°F C.C.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Dry powder, chemical foam, water fog, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** None
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Vapor from molten benzoic acid may form explosive mixture with air. Concentrated dust may form explosive mixture.
- 4.7 **Auto Ignition Temperature:** 1063°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Not pertinent
- 5.2 **Reactivity with Common Materials:** Not pertinent
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
200 ppm/7 hr/goldfish/lethal/fresh water  
500 ppm/1 hr/sunfish/lethal/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
165%, 5 days
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** USP, FCC grade: 99.5%-100.5%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | -              |
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 122.12
- 9.3 **Boiling Point at 1 atm:** 480.6°F = 249.2°C = 522.4°K
- 9.4 **Freezing Point:** 252.1°F = 122.3°C = 395.5°K
- 9.5 **Critical Temperature:** 894.2°F = 479°C = 752.2°K
- 9.6 **Critical Pressure:** 660 psia = 45 atm = 4.6 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.316 at 28°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 33.89 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BENZOIC ACID

BZA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.340		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BENZOYL CHLORIDE

BZC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzenecarbonyl chloride	Watery liquid	Colorless to slightly brown
Sinks and reacts slowly with water producing a poisonous gas.		
<b>Keep people away. Evacuate area in case of large discharge.</b> <b>Avoid contact with liquid and vapor.</b> <b>Wear goggles and self-contained breathing apparatus.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>		
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED. Wear goggles and self-contained breathing apparatus. DO NOT USE WATER. Extinguish with foam, dry chemical, or carbon dioxide.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Do not add water to undissolved material  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_6H_5COCl$   
2.3 IMO/UN Designation: 8/1736  
2.4 DOT ID No.: 1736  
2.5 CAS Registry No.: 98-88-4  
2.6 NAERG Guide No.: 137  
2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full protective clothing, including full-face respirator for acid gases and organic vapors (yellow GMC canister), close-fitting goggles, nonslip rubber gloves, plastic apron, face shield.
- 3.2 **Symptoms Following Exposure:** INHALATION: may irritate eyes, nose and throat. INGESTION: causes acute discomfort. SKIN: causes irritation and burning.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; administer oxygen with patient in sitting position. INGESTION: give water; call physician at once; give milk. EYES: flush with water for 15 min.; get medical attention. SKIN: wash with plenty of soap and water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 0.5 ppm.  
3.7 **Toxicity by Ingestion:** Currently not available.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 162°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical, water fog  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water spray. Do not allow water to enter containers.  
4.5 **Special Hazards of Combustion Products:** Highly poisonous phosgene gas may be formed in fires.  
4.6 **Behavior in Fire:** At fire temperatures the compound may react violently with water or steam.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Slow reaction with water to produce hydrochloric acid fumes. Reaction much faster with steam.  
5.2 **Reactivity with Common Materials:** Slow corrosion of metals, but no immediate hazard.  
5.3 **Stability During Transport:** Not pertinent  
5.4 **Neutralizing Agents for Acids and Caustics:** Soda ash and water: lime  
5.5 **Polymerization:** Does not occur  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
200 ppm/7 hr/goldfish/lethal/fresh water  
500 ppm/1 hr/sunfish/lethal/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
165%, 5 days  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%; special grade  
7.2 **Storage Temperature:** Store in cool, dry area  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	1
Special (White).....	W

  
8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCL List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 140.57  
9.3 **Boiling Point at 1 atm:** 387°F = 197.3°C = 470.5°K  
9.4 **Freezing Point:** 30.9°F = -0.6°C = 272.6°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.211 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** 36.3 dynes/cm = 0.0363 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** -10,030 Btu/lb = -5570 cal/g = -233.2 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# BENZOYL CHLORIDE

BZC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
36	76.809	85	0.301		N	45	1.754
38	76.750	90	0.306		O	50	1.671
40	76.700	95	0.311		T	55	1.594
42	76.639	100	0.317			60	1.522
44	76.580	105	0.322		P	65	1.454
46	76.520	110	0.327		E	70	1.390
48	76.459	115	0.332		R	75	1.331
50	76.389	120	0.338		T	80	1.275
52	76.320	125	0.343		I	85	1.222
54	76.259	130	0.348		N	90	1.172
56	76.190	135	0.354		E	95	1.125
58	76.110	140	0.359		N	100	1.081
60	76.040	145	0.364		T	105	1.039
62	75.959	150	0.369			110	1.000
64	75.889					115	0.963
66	75.809						
68	75.730						
70	75.639						
72	75.559						
74	75.469						
76	75.389						
78	75.299						
80	75.200						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	60	0.006	60	0.00014		N
	E	70	0.008	70	0.00021		O
	A	80	0.012	80	0.00030		T
	C	90	0.018	90	0.00042		
	T	100	0.025	100	0.00059		P
	S	110	0.035	110	0.00082		E
		120	0.049	120	0.00112		R
	S	130	0.068	130	0.00151		T
	L	140	0.093	140	0.00202		I
	O	150	0.125	150	0.00268		N
	W	160	0.167	160	0.00353		E
	L	170	0.221	170	0.00459		N
	Y	180	0.290	180	0.00593		T
		190	0.377	190	0.00760		
		200	0.487	200	0.00966		
		210	0.623	210	0.01219		

# BENZALDEHYDE

BZD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzoic aldehyde Oil of bitter almond		Watery liquid	Colorless to pale yellow	Bitter almond odor
		May float or sink in water.		
Keep people away. Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_6H_5CHO$   
2.3 IMO/UN Designation: 3.3/1990  
2.4 DOT ID No.: 1990  
2.5 CAS Registry No.: 100-52-7  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51622

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Chemical goggles and protective clothing.  
3.2 **Symptoms Following Exposure:** Inhalation of concentrated vapor may irritate eyes, nose and throat. Liquid is irritating to the eyes. Prolonged contact with the skin may cause irritation.  
3.3 **Treatment of Exposure:** SKIN, EYE CONTACT: move victim to fresh air. Call physician immediately. Wash contaminated skin area with water. Flush eyes with plenty of water for at least 15 min. INGESTION: induce vomiting. Call a physician.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5$  to  $5$  g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.042 ppm.  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 165°F O.C. 148°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray, foam, carbon dioxide or dry chemical.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 378°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 3.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 50%, 10 days 150%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 3  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical grade-98.0% NF (FCC) grade-98.0%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Inerted  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Class 9  
8.2 **49 CFR Class:** 9  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 106.12  
9.3 **Boiling Point at 1 atm:** 354°F = 179°C = 452°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** 665.6°F = 352°C = 625.2°K  
9.6 **Critical Pressure:** 316 psia = 21.5 atm = 2.18 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.046 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 40.0 dynes/cm = 0.040 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 15.5 dynes/cm = 0.0155 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.66  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1  
9.12 **Latent Heat of Vaporization:** 156 Btu/lb = 86.5 cal/g =  $3.62 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -13,730 Btu/lb = -7630 cal/g =  $-319.5 \times 10^3$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BENZALDEHYDE

BZD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	66.049	52	0.428	55	1.060	52	2.643
50	65.740	54	0.428	60	1.053	54	2.502
60	65.440	56	0.428	65	1.047	56	2.369
70	65.129	58	0.428	70	1.040	58	2.245
80	64.820	60	0.428	75	1.033	60	2.128
90	64.520	62	0.428	80	1.026	62	2.018
100	64.209	64	0.428	85	1.020	64	1.914
110	63.900	66	0.428	90	1.013	66	1.817
120	63.590	68	0.428	95	1.006	68	1.725
130	63.280	70	0.428	100	1.000	70	1.638
140	62.970	72	0.428	105	0.993	72	1.556
150	62.660	74	0.428	110	0.986	74	1.479
160	62.350	76	0.428	115	0.979	76	1.407
170	62.040	78	0.428	120	0.973	78	1.338
180	61.730	80	0.428	125	0.966	80	1.273
190	61.410	82	0.428	130	0.959	82	1.212
200	61.100	84	0.428	135	0.952	84	1.154
210	60.790	86	0.428	140	0.946	86	1.100
		88	0.428	145	0.939	88	1.048
		90	0.428	150	0.932	90	0.999
		92	0.428			92	0.953
		94	0.428			94	0.909
		96	0.428				
		98	0.428				
		100	0.428				
		102	0.428				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.300	55	0.005	55	0.00010	0	0.201
		60	0.007	60	0.00013	25	0.213
		65	0.009	65	0.00016	50	0.224
		70	0.011	70	0.00020	75	0.235
		75	0.013	75	0.00025	100	0.246
		80	0.017	80	0.00031	125	0.257
		85	0.021	85	0.00037	150	0.267
		90	0.025	90	0.00046	175	0.277
		95	0.031	95	0.00055	200	0.287
		100	0.038	100	0.00067	225	0.297
		105	0.046	105	0.00081	250	0.307
		110	0.056	110	0.00097	275	0.316
		115	0.068	115	0.00116	300	0.326
		120	0.082	120	0.00139	325	0.335
		125	0.098	125	0.00166	350	0.344
		130	0.117	130	0.00197	375	0.352
		135	0.140	135	0.00233	400	0.361
		140	0.167	140	0.00275	425	0.369
		145	0.198	145	0.00324	450	0.377
		150	0.234	150	0.00380	475	0.385
		155	0.277	155	0.00445	500	0.393
		160	0.326	160	0.00520	525	0.401
		165	0.383	165	0.00605	550	0.408
		170	0.448	170	0.00703	575	0.416
		175	0.523	175	0.00815	600	0.423

# BENZYL ACETATE

BZE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, phenylmethyl ester alpha-Acetoxystoluene Acetic acid, benzyl ester Benzyl ethanoate NCI-C06508 Phenylmethyl acetate	Liquid  Colorless  Pear-like odor  Slightly soluble in water.
<b>Keep people away.</b> <b>Avoid contact with liquid and vapor.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Wear self-contained breathing apparatus and protective clothing. Extinguish with water sprays, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Contain  
Collection Systems: Skim; Pump;  
Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 34; Esters  
2.2 **Formula:** CH<sub>3</sub>CO<sub>2</sub>CH<sub>2</sub>C<sub>6</sub>H<sub>5</sub>  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 140-11-4  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots and heavy rubber gloves.  
3.2 **Symptoms Following Exposure:** Harmful if inhaled. May be harmful if swallowed or absorbed through the skin. Vapor or mist is irritating to the eyes, mucous membrane and upper respiratory tract.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES - OR - SKIN: Immediately flush with copious amounts of water for at least 15 minutes.  
3.4 **TLV-TWA:** 10 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 830 mg/kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Carcinogenic  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 200°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray, carbon dioxide, dry chemical, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 150.18  
9.3 **Boiling Point at 1 atm:** 402.8°F = 206°C = 479.2°K  
9.4 **Freezing Point:** -59.8°F = -51°C = 222.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.040  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 5.18  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** <0.01 psia

### NOTES

# BENZYL ACETATE

BZE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	113 164 190 216 230 247 266 291 330 372 416	0.019 0.097 0.193 0.387 0.445 0.774 1.160 1.934 3.867 7.734 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.230 0.241 0.253 0.264 0.275 0.286 0.297 0.307 0.317 0.327 0.337 0.347 0.356 0.366 0.375 0.384 0.393 0.401 0.410 0.418 0.426 0.434 0.442 0.449 0.457

# BENZIDINE

BZI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> p,p'-Bianiline (1,1'-Biphenyl)-4,4'-diamine p,p'-Diaminobiphenyl p-Diaminodiphenyl	Solid, crystals, powder, leaflets  Grayish-yellow, white, reddish gray  Sinks and very slowly mixes.
<b>AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources. Call fire department. Evacuate area in case of large discharge. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Move container from fire area if you can do it without risk.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Poisonous if inhaled or absorbed through the skin. May cause dermatitis, irritation or sensitization. If in eyes or on skin, flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Poisonous if swallowed or absorbed through the skin. May cause contact dermatitis, irritation or sensitization. Ingestion may cause nausea and vomiting. IF IN EYES OR ON SKIN, flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{NH}_2\text{C}_6\text{H}_4\text{C}_6\text{H}_4\text{NH}_2$
- 2.3 IMO/UN Designation: 6.1/1885
- 2.4 DOT ID No.: 1885
- 2.5 CAS Registry No.: 92-87-5
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51455

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Poisonous if inhaled, swallowed or absorbed through skin. May cause contact dermatitis, irritation or sensitization. Ingestion may cause nausea and vomiting.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Immediately flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If victim is unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 **TLV-TWA:** Human carcinogen; no exposure permitted.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 309 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** May cause mutagenic, tumorigenic and carcinogenic effects; liver and kidney damage; hemolysis and bone marrow depressions.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Contain highly toxic NO<sub>x</sub> fumes.
- 4.6 **Behavior in Fire:** Produces highly toxic fumes.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 80.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available.
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 20.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 20 ppm/96 hr/fatheads/LC<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Not concentrated through food chain.
- 6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Not listed
- 7.4 **Venting:** Not pertinent
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: 1 pound
- 8.7 EPA Pollution Category: X
- 8.8 RCRA Waste Number: U021
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 184.24
- 9.3 Boiling Point at 1 atm: 755.1°F = 401.7°C = 674.9°K
- 9.4 Freezing Point: 241.7°F = 116.5°C = 389.7°K
- 9.5 Critical Temperature: 1,220°F = 659.8°C = 933°K (est)
- 9.6 Critical Pressure: 479 psia = 32.6 atm = 3.30 MN/m<sup>2</sup> (est)
- 9.7 Specific Gravity: 2.150 at 20°C
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: 6.4 (est)
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Not pertinent

### NOTES

# BENZIDINE

BZI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
53	0.040		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BENZAL CHLORIDE

BZL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzyl dichloride Benzylene chloride Benzylidene chloride Chlorobenzal	Liquid  Colorless to brown  Pungent  Sinks in water. Reacts with water.
Avoid contact with liquid and vapor. Keep people away. Wear positive pressure breathing apparatus and special protective clothing. Shut off ignition sources. Call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE. POISONOUS AND IRRITATING GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Wear positive pressure breathing apparatus and special protective clothing. Extinguish small fires with dry chemical, carbon dioxide, water spray, or foam; large fires with water spray, fog or foam. Combat fires from safe distance or protected location (behind barriers) with unmanned monitor nozzle.
<b>Exposure</b>	Call for medical aid.  VAPOR May be fatal if inhaled or absorbed through skin. Lacrimator. Irritating to eyes and respiratory tract. Very high concentrations may cause central nervous system depression. Effects may be delayed; keep under observation. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID May be fatal if swallowed or absorbed through the skin. May burn skin and eyes. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open if appropriate. Speed in removing material from skin is extremely important. Remove and isolate contaminated clothing and shoes. Effects may be delayed; keep under observation. IF SWALLOWED and victim is CONSCIOUS, have victim drink several glasses of water. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>6</sub> H <sub>5</sub> CHCl <sub>2</sub> 2.3 IMO/UN Designation: 6.1/1886 2.4 DOT ID No.: 1886 2.5 CAS Registry No.: 98-87-3 2.6 NAERG Guide No.: 156 2.7 Standard Industrial Trade Classification: 51139
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Wear positive pressure breathing apparatus and special protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Poisonous; may be fatal if inhaled, absorbed through skin or swallowed. Lacrimator. Irritating to eyes, skin and respiratory tract. May burn skin and eyes. May cause sore throat, coughing and difficulty in breathing. Very high concentrations may cause central nervous system depression. 3.3 <b>Treatment of Exposure:</b> INHALATION: Remove victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Immediately flush with running water for at least 15 minutes; hold eyelids open. Speed in removing material from skin is extremely important. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed. Keep victim under observation. INGESTION: If swallowed and victim is CONSCIOUS, immediately give several glasses of water. Do not induce vomiting. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 3.249 g/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Possesses mutagenic and tumorigenic properties. Suspected animal carcinogen; indefinite human carcinogen. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Highly irritating to the eyes and respiratory system. 3.11 <b>Liquid or Solid Characteristics:</b> Strong irritant and lachrymator. May burn skin and eyes. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 198°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, carbon dioxide, water spray or foam. Large fires: water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion**  
**Products:** Contain highly toxic irritating phosgene and hydrogen chloride.  
4.6 **Behavior in Fire:** Supports combustion: Decomposes to produce toxic and corrosive fumes containing phosgene and hydrogen chloride.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Readily hydrolyzes to benzaldehyde under neutral, acid or alkaline conditions.  
5.2 **Reactivity with Common Materials:** Reacts with common metals (except nickel and lead) to produce heat and Friedel-Crafts self-condensation type products along with toxic and corrosive hydrogen chloride. Heat build up causes the reaction to accelerate.  
5.3 **Stability During Transport:** Stable at atmospheric pressure and ambient temperature when kept free of reactive metals and moisture. Material (stabilized and unstabilized) should be consumed within 90 days. Exposure to moist air and/or heat reduces this period considerably below 90 days.  
5.4 **Neutralizing Agents for Acids and Caustics:** Use sodium carbonate or lime to absorb residual spill material.  
5.5 **Polymerization:** Can react with common metals (except nickel and lead) to produce Friedel-Crafts condensation products and hydrogen chloride.  
5.6 **Inhibitor of Polymerization:** Propylene oxide

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (3)  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%; 75 to 93% (crude)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** U017  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 161.03  
9.3 **Boiling Point at 1 atm:** 417.2°F = 214.0°C = 487.2°K  
9.4 **Freezing Point:** 3.0°F = -16.1°C = 257.1°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.2557 at 14°C  
9.8 **Liquid Surface Tension:** 20.20 dynes/cm = 0.0202 N/m at 203.5°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 5.6 (calculated)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 124 Btu/lb = 69 cal/g = 2.9 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# BENZAL CHLORIDE

BZL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
57	78.400		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S	100 125 150 175 200 225 250 275 300 325 350	0.018 0.050 0.114 0.231 0.425 0.729 1.181 1.826 2.718 3.919 5.501	40 60 80 100 120 140 160 180 200	0.00052 0.00216 0.00595 0.01307 0.02486 0.04282 0.06858 0.10390 0.15067		C U R R E N T L Y  N O T  A V A I L A B L E

# BENZYLAMINE

BZM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> alpha-Aminotoluene Phenylmethyl amine	Liquid  Colorless to light yellow  Strong ammonia odor  Floats and mixes with water.
Keep people away. Avoid contact with liquid and vapor. Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, headache, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if Swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_6H_5CH_2NH_2$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51454

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Self-contained breathing apparatus; goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Inhalation of vapor causes irritation of the mucous membranes of the nose and throat, and lung irritation with respiratory distress and cough. Headache, nausea, faintness, and anxiety can occur. Exposure to vapor produces eye irritation with lachrymation, conjunctivitis, and corneal edema resulting in halos around lights. Direct local contact with liquid is known to produce severe and sometimes permanent eye damage and skin burns. Vapors may also produce primary skin irritation and dermatitis.
- 3.3 Treatment of Exposure: INHALATION: remove victim from exposure; if breathing is difficult, administer oxygen; if breathing has stopped, begin artificial respiration. EYES or SKIN: wash with copious amounts of water for 15 min.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 168°F O.C.
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
- 4.5 Special Hazards of Combustion Products: Toxic nitrogen oxides may form in a fire.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: 4.13 mm/min.
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 48.8 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 12.5 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: In presence of moisture may weakly corrode some metals. Liquid will attack some plastics.
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Flush with water.
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 60 ppm/48 hr/D. magna/TL<sub>50</sub>/fresh water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 98.5+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: Ventilated (natural)
- 7.4 Venting: Open (flame arrester)
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 107.16
- 9.3 Boiling Point at 1 atm: 364.1°F = 184.5°C = 457.7°K
- 9.4 Freezing Point: (approx.) -51°F = -46°C = 227°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 0.98 at 20°C (liquid)
- 9.8 Liquid Surface Tension: 39.5 dynes/cm = 0.0395 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: 3.70
- 9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.070
- 9.12 Latent Heat of Vaporization: 164 Btu/lb = 91 cal/g =  $3.8 \times 10^5$  J/kg
- 9.13 Heat of Combustion: -16,260 Btu/lb = -9,040 cal/g =  $-378 \times 10^5$  J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: -43 Btu/lb = -24 cal/g =  $-1.0 \times 10^6$  J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# BENZYLAMINE

BZM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	62.210	51	0.450	51	1.048	34	1.256
40	62.070	52	0.450	52	1.048	36	1.245
45	61.930	53	0.450	53	1.048	38	1.234
50	61.790	54	0.450	54	1.048	40	1.223
55	61.640	55	0.450	55	1.048	42	1.213
60	61.500	56	0.450	56	1.048	44	1.202
65	61.360	57	0.450	57	1.048	46	1.192
70	61.220	58	0.450	58	1.048	48	1.182
75	61.070	59	0.450	59	1.048	50	1.172
80	60.930	60	0.450	60	1.048	52	1.163
85	60.790	61	0.450	61	1.048	54	1.153
90	60.650	62	0.450	62	1.048	56	1.144
95	60.510	63	0.450	63	1.048	58	1.135
100	60.360	64	0.450	64	1.048	60	1.126
		65	0.450	65	1.048	62	1.117
		66	0.450	66	1.048	64	1.108
		67	0.450	67	1.048	66	1.099
		68	0.450	68	1.048	68	1.091
						70	1.082
						72	1.074
						74	1.066
						76	1.058
						78	1.050
						80	1.042
						82	1.034
						84	1.027

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T		N O T	0	0.249
			P E R		P E R	20	0.260
			T I N E N T		T I N E N T	40	0.270
						60	0.280
						80	0.291
						100	0.301
						120	0.310
						140	0.320
						160	0.329
						180	0.339
						200	0.348
						220	0.357
						240	0.366
						260	0.375
						280	0.383
						300	0.392
						320	0.400
						340	0.408
						360	0.416
						380	0.424
						400	0.432
						420	0.440
						440	0.447

# BENZONITRILE

BZN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzoic acid nitrile Cyanobenzene Phenylcyanide	Liquid  Colorless  Almond-like odor  May float or sink in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, difficult breathing or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause headache, nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim; Pump; Dredge Chemical and Physical Treatment: Absorb	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>6</sub> H <sub>5</sub> CN 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 2224 2.5 CAS Registry No.: 100-47-0 2.6 NAERG Guide No.: 152 2.7 Standard Industrial Trade Classification: 51484
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Rubber gloves; splash-proof goggles; rubber boots or rubber overshoes; impervious clothing for splash protection; cartridge-type mask or other protection against vapor must be worn for working in poorly ventilated area or where poisoning by inhalation may be possible.  3.2 <b>Symptoms Following Exposure:</b> Benzonitrile may enter the human body by ingestion, absorption through the skin, or inhalation. The earliest symptoms of cyano compound intoxication may be weakness, headaches, confusion, and occasionally nausea and vomiting. The respiratory rate and depth will usually be increased at the beginning and at later stages become slow and gasping. Blood pressure is usually normal, especially in the mild or moderately severe cases, although the pulse rate is usually more rapid than normal.  3.3 <b>Treatment of Exposure:</b> INHALATION: remove patient to fresh air; get immediate medical attention. INGESTION: Call physician immediately. Until physician arrives, take the following steps: a. Provide for inhalation of amyl nitrite vapor from ampules crushed in a handkerchief and held to the nose of the victim. b. Induce vomiting unless patient is unconscious. (Gastric lavage should be employed by, or under the supervision of, a physician.) c. Keep patient warm and quiet until medical attention arrives. EYES: immediately flush with large volumes of water for at least 15 min. SKIN: wash thoroughly at once, without scrubbing, with large amounts of soap and water. OTHER: exposed personnel should be checked periodically for chronic toxic effects.  3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: 5 mg/m <sup>3</sup> as cyanide. 3.7 Toxicity by Ingestion: Grade 2; oral rat LD <sub>50</sub> = 800 mg/kg 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: 25 mg/m <sup>3</sup> as CN 3.14 OSHA PEL-TWA: 5 mg/m <sup>3</sup> as cyanide. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 167°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Toxic hydrogen cyanide and oxides of nitrogen may form in fire.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Difficult to burn  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 44.0 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 10.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Will attack some plastics  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
5 ppm/24 hr/rainbow trout/no effect/ fresh water  
135 ppm/96 hr/fathead minnow/TL<sub>50</sub>/soft fresh water  
78 ppm/96 hr/fathead minnow/TL<sub>50</sub>/hard fresh water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 60% (theo.), 18 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed.

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Pure, 99+%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Ventilated (natural)  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 5000 pounds  
8.7 EPA Pollution Category: D  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 103.12  
9.3 Boiling Point at 1 atm: 376°F = 191°C = 464°K  
9.4 Freezing Point: 9.0°F = -12.8°C = 260.4°K  
9.5 Critical Temperature: 799.2°F = 426.2°C = 699.4°K  
9.6 Critical Pressure: 611 psia = 41.6 atm = 4.22 MN/m<sup>2</sup>  
9.7 Specific Gravity: 1.01 at 25°C (liquid)  
9.8 Liquid Surface Tension: 34.7 dynes/cm = 0.0347 N/m at 25°C  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 3.6  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.091  
9.12 Latent Heat of Vaporization: 157.7 Btu/lb = 87.6 cal/g = 3.67 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -15,100 Btu/lb = -8,400 cal/g = -351 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# BENZONITRILE

BZN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	64.200	55	0.440	75	1.031	77	1.250
40	64.049	60	0.440	80	1.027		
45	63.900	65	0.440	85	1.022		
50	63.750	70	0.440	90	1.017		
55	63.590	75	0.440	95	1.013		
60	63.440	80	0.440	100	1.008		
65	63.290	85	0.440	105	1.003		
70	63.130	90	0.440	110	0.999		
75	62.980	95	0.440	115	0.994		
80	62.830	100	0.440	120	0.989		
85	62.680	105	0.440	125	0.984		
90	62.520	110	0.440	130	0.980		
95	62.370	115	0.440	135	0.975		
100	62.220	120	0.440	140	0.970		
		125	0.440	145	0.966		
		130	0.440	150	0.961		
		135	0.440	155	0.956		
		140	0.440	160	0.952		
				165	0.947		
				170	0.942		
				175	0.938		
				180	0.933		
				185	0.928		
				190	0.924		
				195	0.919		
				200	0.914		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	110	0.050	110	0.00084	0	0.202
	N	120	0.068	120	0.00112	20	0.211
	S	130	0.091	130	0.00149	40	0.220
	O	140	0.122	140	0.00195	60	0.228
	L	150	0.161	150	0.00253	80	0.236
	U	160	0.211	160	0.00326	100	0.244
	B	170	0.273	170	0.00417	120	0.252
	L	180	0.352	180	0.00528	140	0.260
	E	190	0.449	190	0.00664	160	0.267
		200	0.569	200	0.00829	180	0.275
		210	0.716	210	0.01028	200	0.282
		220	0.896	220	0.01266	220	0.289
		230	1.113	230	0.01550	240	0.296
		240	1.374	240	0.01886	260	0.303
		250	1.685	250	0.02281	280	0.310
		260	2.056	260	0.02745	300	0.316
		270	2.496	270	0.03286	320	0.323
		280	3.013	280	0.03913	340	0.329
		290	3.619	290	0.04637	360	0.335
		300	4.325	300	0.05470	380	0.341
		310	5.146	310	0.06423	400	0.347
		320	6.096	320	0.07511	420	0.353
		330	7.190	330	0.08746	440	0.358
		340	8.445	340	0.10140		
		350	9.880	350	0.11720		
		360	11.510	360	0.13500		

# BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE

BZO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzyl dimethylstearyl ammonium chloride Stearyl dimethylbenzyl ammonium chloride Tallow benzyl dimethyl ammonium chloride	Solid or thick liquid      White      Mild odor
<b>Keep people away.</b> Avoid contact with liquid and solid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. DO NOT INDUCE VOMITTING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:** (C<sub>18</sub>H<sub>37</sub>CH<sub>2</sub>)(CH<sub>3</sub>)<sub>2</sub>(C<sub>18</sub>H<sub>37</sub>)NCl
- 2.3 **IMO/UN Designation:** Not listed
- 2.4 **DOT ID No.:** Not listed
- 2.5 **CAS Registry No.:** Currently not available
- 2.6 **NAERG Guide No.:** Not listed
- 2.7 **Standard Industrial Trade Classification:** 51481

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves
- 3.2 **Symptoms Following Exposure:** Ingestion causes gastrointestinal disturbances. Contact with chemical irritates eyes and skin and may damage eyes.
- 3.3 **Treatment of Exposure:** INGESTION: do NOT induce vomiting; give large quantities of fluid and call physician immediately. EYES: flush with plenty of water for at least 15 min.; call a physician. SKIN: remove contaminated clothing; flush skin with plenty of water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 4,000 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and hydrochloric acid fumes may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 191.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 53.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 5 ppm/48 hr/australorboris snails/80% kill/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure, 95+%; 24-26% solution in water.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 411
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes at 120°C)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** >1.1 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE

BZO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BENZOPHENONE

BZP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzoyl benzene Diphenyl ketone Diphenyl methanone alpha-Oxodiphenylmethane alpha-Oxoditane	Solid  White  Flowery odor  May float or sink in water.
Keep people away. Avoid contact with liquid and solid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. If swallowed will cause nausea, or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_{15}H_{10}O$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51629

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust/mist respirator; goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Ingestion causes gastrointestinal disturbances. Contact causes eye irritation and, if prolonged, irritation of skin.
- 3.3 Treatment of Exposure: INHALATION: remove to fresh air. INGESTION: get medical attention. EYES: flush with water for at least 15 min.; get medical attention if irritation persists. SKIN: flush with water, wash with soap and water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 1; acute oral rat  $LD_{50} > 10,000$  mg/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:  $> 270^{\circ}\text{F}$  C.C.
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide, water spray.
- 4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 71.4 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 18.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Will attack some plastics
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at  $15^{\circ}\text{C}$  and 1 atm: Solid
- 9.2 Molecular Weight: 182
- 9.3 Boiling Point at 1 atm:  $581.9^{\circ}\text{F} = 305.5^{\circ}\text{C} = 578.7^{\circ}\text{K}$
- 9.4 Freezing Point:  $118.2^{\circ}\text{F} = 47.9^{\circ}\text{C} = 321.1^{\circ}\text{K}$
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.085 at  $50^{\circ}\text{C}$  (liquid)
- 9.8 Liquid Surface Tension: 42 dynes/cm = 0.042 N/m at  $50^{\circ}\text{C}$
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: 126.0 Btu/lb = 70.0 cal/g =  $2.93 \times 10^5$  J/kg
- 9.13 Heat of Combustion: -15,400 Btu/lb = -8,550 cal/g =  $-358 \times 10^3$  J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: 25.53 cal/g
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES



# BENZOPHENONE

BZP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
123	67.690		N		N	125	1.523
124	67.660		O		O	130	1.515
125	67.620		T		T	135	1.507
126	67.589					140	1.500
127	67.549		P		P	145	1.492
128	67.520		E		E	150	1.485
129	67.490		R		R	155	1.478
130	67.450		T		T	160	1.471
131	67.419		I		I	165	1.465
132	67.379		N		N	170	1.458
133	67.349		E		E	175	1.452
134	67.309		N		N	180	1.445
135	67.280		T		T	185	1.439
136	67.240					190	1.433
137	67.209					195	1.427
138	67.169					200	1.421
139	67.139					205	1.416
140	67.099					210	1.410
						215	1.404
						220	1.399
						225	1.394
						230	1.388
						235	1.383
						240	1.378
						245	1.373

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# P-BENZOQUINONE

BZQ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzoquinone 1,4-Benzoquinone 1,4-Cyclohexadienedione 2,5-Cyclohexadiene-1,4-dione Quinone	Solid, crystals  Yellow     Sinks and very slowly mixes with water.	Acrid, chlorine-like, irritating, penetrating
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear positive pressure breathing apparatus and special protective clothing. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. Poisonous or irritating gases may be produced in fire. Cylinder may explode in heat of fire. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Move container from fire area if you can do it without risk. Fight fire from maximum distance.	
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b> <b>DUST</b> Poisonous; may be fatal if inhaled. Irritating to mucous membranes. Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  <b>SOLID</b> Poisonous; may be fatal if swallowed or absorbed through skin. Can cause severe damage to the eyes, skin and mucous membranes. IF IN EYES OR ON SKIN, flush with running water for at least 15 min.; hold eyelids open if necessary. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Effects may be delayed; keep victim under observation. IF SWALLOWED and victim is CONSCIOUS, have victim drink large volumes of water and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** C<sub>6</sub>H<sub>4</sub>O<sub>2</sub>  
2.3 **IMO/UN Designation:** 6.1/2587  
2.4 **DOT ID No.:** 2587  
2.5 **CAS Registry No.:** 106-51-4  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51629

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear positive pressure breathing apparatus and special protective clothing.
- 3.2 **Symptoms Following Exposure:** Poisonous; may be fatal if inhaled, swallowed or absorbed through the skin. Contact with solid, vapor or solution can cause severe local damage to the skin and mucous membranes. Symptoms include discoloration, severe irritation, erythema, swelling, papules and vesicles. Necrosis may result from long exposure. The eyes may experience irritation, conjunctivitis, photophobia, lachrymation and burning sensations. The cornea may suffer ulceration and scarring. Chronic eye exposure causes gradual brownish discoloration of the conjunctiva and cornea, small corneal opacities and damage in corneal structure which cause loss of visual acuity.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Immediately flush with running water for at least 15 min.; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. Speed in removing material from skin is of extreme importance. Effects may be delayed; keep victim under observation. INGESTION: If victim is conscious, have victim drink large quantities of water and induce vomiting. If victim is unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 **TLV-TWA:** 0.1 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 130 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Causes mutagenic and tumorigenic effects. Indefinite animal carcinogen.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant and very injurious to the eyes.  
3.12 **Odor Threshold:** 0.1 ppm  
3.13 **IDLH Value:** 100 mg/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 0.1 ppm.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 195°F O.C.  
171°F. O.C.; 77°C C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
**Products:** Contain irritating and toxic fumes, including carbon dioxide and carbon monoxide.
- 4.6 **Behavior in Fire:** Cylinder may explode in heat of fire. In powder form, it is capable or producing a dust explosion.
- 4.7 **Auto Ignition Temperature:** 1040°F.
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** May react with water.
- 5.2 **Reactivity with Common Materials:** Will attack some forms of plastics, rubber and coatings.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Will not occur.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
5-10 mg/l/perch/LD<sub>50</sub>
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Not listed
- 7.4 **Venting:** Not pertinent
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** U197
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 108.10
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** 240°F = 115.7°C = 389°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.318 at 20°C
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 3.7
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Data not available
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -66.50 Btu/lb = -36.92 cal/g = -1.546X10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Not pertinent

### NOTES

# P-BENZOQUINONE

BZQ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.500	68	0.002		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# BENZENETHIOL

BZT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Mercaptobenzene Phenyl mercaptan Phenylthiol Thiophenol	Liquid  Colorless to light yellow  Burnt rubber, garlic like, stench  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear positive pressure breathing apparatus and special chemical protective clothing. Shut off ignition sources and call fire department. Stay upwind and use water spray to knock down vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE POISONOUS GASES ARE PRODUCED IN FIRE OR WHEN HEATED. Container may explode in heat of fire. Vapor explosion and poison hazard indoors, outdoors or in sewers. Wear positive pressure breathing apparatus and special chemical protective clothing. Extinguish small fire with: dry chemical, carbon dioxide, water spray or foam. Large fires: water spray, fog or foam. Cool exposed containers with water. Combat fires from safe distance or protected location (behind barriers) with unmanned monitor nozzle.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Poisonous. May be fatal if inhaled or absorbed through skin. Irritating to eyes, skin and mucous membranes. Over exposure may cause headache, dizziness, coughing, difficulty in breathing, nausea, and vomiting. Symptoms may be delayed. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Poisonous. May be fatal if swallowed or absorbed through skin. May burn skin and eyes. Speed in removing material from skin is extremely important. IF IN EYES OR ON SKIN, immediately flush with running water for at least 15 minutes; hold eyelids open occasionally if appropriate. Remove and isolate contaminated clothing and shoes at the site. Effects may be delayed; keep victim under observation. IF SWALLOWED and victim is CONSCIOUS, have victim drink several glasses of water and induce vomiting by touching back of throat. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effects of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>6</sub>H<sub>6</sub>S  
2.3 IMO/UN Designation: 6.1/2337  
2.4 DOT ID No.: 2337  
2.5 CAS Registry No.: 108-98-5  
2.6 NAERG Guide No.: 131  
2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear positive pressure breathing apparatus and special chemical protective clothing.
- 3.2 **Symptoms Following Exposure:** Poisonous; may be fatal if inhaled, swallowed or absorbed through skin. Causes eye burns and skin irritation. It is capable of producing severe irritation of the eyes, skin, respiratory and digestive tract. Over exposure may cause headache, dizziness, coughing, difficulty in breathing, nausea, and vomiting. Inhalation of high doses may cause lung damage, prolonged or repeated contact with the skin may cause dermatitis. Symptoms may not appear until several hours after exposure and they are made more severe by physical effort.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Immediately flush eyes or skin with running water for at least 15 minutes. Hold upper and lower eyelids open occasionally if appropriate. Speed in removing material from skin is extremely important. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. INGESTION: If CONSCIOUS, have victim drink several glasses of water and induce vomiting by touching the back of the throat with a finger; repeat until vomitus is clear. If UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> = 46 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Lung, liver and kidney changes were found in mice after inhalation of high doses.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury.  
3.11 **Liquid or Solid Characteristics:** Severe eye and skin irritant. Corrosive to eyes and skin.  
3.12 **Odor Threshold:** 0.062 mg/m<sup>3</sup>  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 127°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Small fires: Dry chemical, carbon dioxide, water spray or foam. Large fires: Water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion**  
**Products:** Contain toxic hydrogen sulfide gas, and vapors which are irritating to the respiratory tract and may cause pulmonary edema. Effects may be delayed several hours or longer.  
4.6 **Behavior in Fire:** May be ignited by heat, sparks or flames. Containers may explode in heat of fire. Vapor, explosion and poison hazard indoors, outdoors or in sewers.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Data not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Mildly corrosive to carbon steel.  
5.3 **Stability During Transport:** In the absence of air, it is stable to 392°F (200°C); it oxidizes in air to yield diphenyl disulfide. Other oxidizing agents react similarly.  
5.4 **Neutralizing Agents for Acids and Caustics:** For small spills: soak up with absorbent; remove absorbent; treat spill area with sodium carbonate slurry. Remove it and treat area with sodium hypochlorite solution (commercial bleach); absorb liquid and remove.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%; 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Not listed  
7.4 **Venting:** Not listed  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** P014  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 110.18  
9.3 **Boiling Point at 1 atm:** 334.4°F = 168°C = 441.2°K  
9.4 **Freezing Point:** 5°F = -15°C = 258.2°K  
9.5 **Critical Temperature:** 778°F = 415°C = 688°K (est.)  
9.6 **Critical Pressure:** 51.9 psia = 35.3 atm = 3.58 MN/m<sup>2</sup> (est.)  
9.7 **Specific Gravity:** 1.075 at 20°C  
9.8 **Liquid Surface Tension:** 39.0 dynes/cm = 0.039 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.8 (calculated)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 156 Btu/lb = 86.5 cal/g = 3.6 X 10<sup>4</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BENZENETHIOL

BZT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	67.100		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	68	1.239

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
59	0.050	75 100 125 150 175 200 225 250 275 300 325	0.022 0.074 0.185 0.393 0.744 1.293 2.104 3.252 4.824 6.912 9.624	75 100 125 150 175 200 225 250 275 300 325	0.00183 0.00285 0.00445 0.00694 0.01081 0.01685 0.02627 0.04095 0.06384 0.09951 0.15512		C U R R E N T L Y  N O T  A V A I L A B L E

# COPPER ACETOARSENITE

CAA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Emerald green Imperial green King's green Meadow green Mills green Moss green Paris green Parrot green Schweinfurth green Vienna green	Solid Powder      Green      Odorless  Sinks and mixes slowly with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST. Stay upwind. Use water spray to "knock down" dust. Wear goggles and dust respirator. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $3\text{Cu}(\text{AsO}_2)_2 \cdot \text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2$
- 2.3 IMO/UN Designation: 6.1/1585
- 2.4 DOT ID No.: 1585
- 2.5 CAS Registry No.: 1299-88-3
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 51499

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; impervious gloves; goggles or face shield.
- 3.2 **Symptoms Following Exposure:** Dust causes eye irritation. Ingestion causes gastric disturbance, tremors, muscular cramps, and nervous collapse which may lead to death.
- 3.3 **Treatment of Exposure:** Following ingestion or unusually severe exposure to dust, get medical attention. Alert doctor to possibility of arsenic poisoning. EYES: flush with water for 15 min. SKIN: wash thoroughly with soap and water. INGESTION: give copious drafts of water and induce repeated vomiting. Give cathartic of 2 oz. Epsom salt in water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; oral  $\text{LD}_{50} = 22 \text{ mg/kg (rat)}$
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Arsenic poisoning
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Poisonous, volatile arsenic oxides may be formed in fires.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** > 5,000 ppm  $\text{LC}_{50}$
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 3  
Human Oral hazard: 3  
Human Contact hazard: 0  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 1014
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** (est.) > 1.1 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COPPER ACETOARSENITE

CAA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	3.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CHLOROACETYL CHLORIDE

CAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chloroacetyl chloride	Liquid  Colorless to light yellow  Sharp, extremely irritating odor  Reacts violently with water. Irritating vapor is produced.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Wear goggles and self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. DO NOT USE WATER ON ADJACENT FIRES. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{ClCH}_2\text{COCl}$   
2.3 IMO/UN Designation: 8/1752  
2.4 DOT ID No.: 1752  
2.5 CAS Registry No.: 79-04-9  
2.6 NAERG Guide No.: 156  
2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Acid-type canister mask; self-contained breathing apparatus (full face); rubber gloves and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory system. External contact causes severe irritation of eyes and skin. Ingestion causes severe irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; support respiration; call physician. EYES: wash with copious amounts of water for 15 min.; call physician. SKIN: wash with large amounts of water; treat burns as required. INGESTION: do NOT induce vomiting; give large amounts of water; call a physician.
- 3.4 TLV-TWA: 0.05 ppm  
3.5 TLV-STEL: 0.15 ppm  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating, such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not flammable
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water on adjacent fires.
- 4.5 **Special Hazards of Combustion Products:** Heat of fire can cause decomposition, with evolution of highly toxic and irritating hydrogen chloride and phosgene vapors.
- 4.6 **Behavior in Fire:** Highly irritating (tear gas) vapors released when heated. Hydrogen chloride gas is released if in contact with water.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously to generate hydrogen chloride (hydrochloric acid).
- 5.2 **Reactivity with Common Materials:** Will react with surface moisture to generate hydrogen chloride, which is corrosive to metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 112.9
- 9.3 Boiling Point at 1 atm: 221°F = 105°C = 378°K
- 9.4 Freezing Point: -8.5°F = -22.5°C = 250.7°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: 1.423 at 20°C (liquid)
- 9.7 Specific Gravity: 1.42 at 20°C (liquid)
- 9.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: 3.9
- 9.11 Ratio of Specific Heats of Vapor (Gas): 1.1191
- 9.12 Latent Heat of Vaporization: 166 Btu/lb = 92.0 cal/g =  $3.85 \times 10^5$  J/kg
- 9.13 Heat of Combustion: (est.) -4,000 Btu/lb = -2,000 cal/g =  $-90 \times 10^6$  J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: (est.) -54 Btu/lb = -30 cal/g =  $-1.3 \times 10^5$  J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES



# CHLOROACETYL CHLORIDE

CAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	89.820	82	0.337	34	1.129	52	0.226
36	89.750	84	0.337	36	1.129	54	0.224
38	89.679	86	0.338	38	1.129	56	0.221
40	89.610	88	0.338	40	1.129	58	0.219
42	89.540	90	0.338	42	1.129	60	0.217
44	89.469	92	0.338	44	1.129	62	0.214
46	89.400	94	0.338	46	1.129	64	0.212
48	89.330	96	0.339	48	1.129	66	0.210
50	89.259	98	0.339	50	1.129	68	0.208
52	89.190	100	0.339	52	1.129	70	0.206
54	89.120	102	0.339	54	1.129	72	0.204
56	89.059	104	0.340	56	1.129	74	0.201
58	88.990	106	0.340	58	1.129	76	0.199
60	88.919	108	0.340	60	1.129	78	0.197
62	88.849	110	0.340	62	1.129	80	0.196
64	88.780	112	0.340	64	1.129	82	0.194
66	88.709	114	0.341	66	1.129	84	0.192
68	88.639	116	0.341	68	1.129	86	0.190
70	88.570	118	0.341	70	1.129		
72	88.500	120	0.341	72	1.129		
74	88.429	122	0.342	74	1.129		
76	88.360	124	0.342	76	1.129		
78	88.290	126	0.342	78	1.129		
80	88.219	128	0.342	80	1.129		
82	88.150	130	0.342	82	1.129		
84	88.080	132	0.343	84	1.129		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	0	0.024	0	0.00056	0	0.155
	E	10	0.039	10	0.00087	20	0.158
	A	20	0.060	20	0.00131	40	0.161
	C	30	0.091	30	0.00194	60	0.164
	T	40	0.134	40	0.00282	80	0.167
	S	50	0.194	50	0.00400	100	0.170
		60	0.276	60	0.00558	120	0.173
		70	0.385	70	0.00765	140	0.176
		80	0.530	80	0.01034	160	0.178
		90	0.719	90	0.01376	180	0.181
		100	0.962	100	0.01807	200	0.184
		110	1.269	110	0.02344	220	0.186
		120	1.656	120	0.03004	240	0.189
		130	2.135	130	0.03808	260	0.191
		140	2.724	140	0.04778	280	0.194
		150	3.442	150	0.05938	300	0.196
		160	4.308	160	0.07312	320	0.199
		170	5.345	170	0.08928	340	0.201
		180	6.577	180	0.10810	360	0.203
		190	8.030	190	0.13000	380	0.206
		200	9.732	200	0.15520	400	0.208
		210	11.710	210	0.18400	420	0.210
		220	14.000	220	0.21670	440	0.212

# CALCIUM FLUORIDE

CAF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Fluorspar Fluospar	Solid powder or granules	Gray	Odorless
	Sinks in water.		
Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Harmful if swallowed. Not irritating to skin or eyes. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CaF}_2$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: For dust only
- 3.2 Symptoms Following Exposure: Little acute toxicity
- 3.3 Treatment of Exposure: Usually no treatment needed
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5$  to  $5 \text{ g/kg}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent
- 3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not flammable
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not flammable
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not Pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not Pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 30000 ppm"/tinca vulgaris/lethal/fresh water  
\*Time period not specified
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Not pertinent
- 6.4 Food Chain Concentration Potential: Not pertinent
- 6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Acid grade: 97.4%; Ceramic grade: 91.5%; Fine powder (dry or damp cake); Gravel fluorspar; Pellet
- 7.2 Storage Temperature: Currently not available
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at  $15^\circ \text{C}$  and 1 atm: Solid
- 9.2 Molecular Weight: 78.08
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 3.18 at  $20^\circ \text{C}$  (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion:  $52.5 \text{ cal/g}$
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# CALCIUM FLUORIDE

CAF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.018		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CALCIUM HYDROXIDE

CAH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Slaked lime	Solid granules      White      Odorless  Sinks in water.
Keep people away. Avoid contact with solid and dust. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to nose and throat if inhaled. Move to fresh air.  SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: Ca(OH)<sub>2</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 1305-62-0
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust-proof goggles and mask.
- 3.2 Symptoms Following Exposure: Dust irritates eyes, nose and throat.
- 3.3 Treatment of Exposure: INGESTION: have victim drink milk and water. DO NOT induce vomiting. EYES: flush with a gentle stream of water for at least 10 min. and consult an ophthalmologist for further treatment without delay. SKIN: wash off the lime and consult a physician.
- 3.4 TLV-TWA: 5 mg/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 1; LD<sub>50</sub> = 5 to 15 g/kg (rat)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: None
- 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent
- 3.11 Liquid or Solid Characteristics: None
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: 15 mg/m<sup>3</sup> total dust; 5 mg/m<sup>3</sup> respirable fraction.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not flammable
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not flammable
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not Pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not Pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 92 ppm/7 hr/trout/toxic/fresh water  
240 ppm/24 hr/mosquito fish/TL<sub>m</sub>/fresh water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 0  
Human Contact hazard: 1  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Agricultural: 65-71%; Industrial: 70-73%; chemical: 71-73%
- 7.2 Storage Temperature: Currently not available
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 74.09
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.24 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# CALCIUM HYDROXIDE

CAH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
64	0.130		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CALCIUM PHOSPHATE

CAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Calcium biphosphate Calcium pyrophosphate Calcium superphosphate DCP Dicalcium phosphate MCP Monocalcium phosphate monohydrate	Solid  White  Odorless   Sinks and mixes with water.
<b>Keep people away.</b> <b>Avoid contact with solid and dust.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** (a)  $\text{CaH}_4(\text{PO}_4)_2 \cdot \text{H}_2\text{O}$  (b)  $\text{CaHPO}_4$   
(c)  $\text{Ca}_3(\text{PO}_4)_2$  (d)  $\text{Ca}_2\text{P}_2\text{O}_7$   
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 10103-46-5  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 52363

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask, goggles, and gloves  
3.2 **Symptoms Following Exposure:** Inhalation of MCP or DCP may cause irritation of upper respiratory tract; prolonged inhalation of concentrated pyrophosphate may cause a deposit of TCP in the lungs. Ingestion of large quantities of any form of calcium phosphate may cause nausea, vomiting, cramps, and diarrhea; MCP may also be corrosive to membranes of mouth, throat, and gastrointestinal tract. Local irritation of the eyes may result from contact with any of these phosphates; prolonged or repeated exposure to MCP may lead to chronic conjunctivitis. Contact with skin by MCP may cause local irritation or chronic dermatitis; prolonged or repeated contact with concentrated aqueous slurries of DCP may cause local irritation.  
3.3 **Treatment of Exposure:** INHALATION: move to clean air; see physician in case of persistent coughing, expectoration, chest pain, or shortness of breath. INGESTION: get medical attention quickly; induce vomiting by giving large amounts of water or warm salty water, or by tickling back of patient's throat; continue until vomitus is clear; follow with milk, eggs, or olive oil to soothe stomach. EYES: immediately flush with large quantities of running water for at least 15 min., holding eyelids apart to insure thorough flushing of eyes and lids; do not attempt to neutralize with chemical agents; get medical attention quickly; if physician is not available, continue irrigation for another 15 min. SKIN: immediately flush with water; remove contaminated clothing under shower; do not attempt to neutralize with chemical agent; get medical attention for persistent irritation.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 0;  $\text{LD}_{50} > 15 \text{ g/kg}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Tribasic is odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Some calcium phosphates form acid solutions in water. These may attack metals with formation of flammable hydrogen gas, which may collect in enclosed spaces.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** NF; USP; Dentrifrice; Reagent  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** Monocalcium phosphate: 252.16; Dicalcium phosphate: 136.06; Calcium pyrophosphate: 254  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 2-3 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CALCIUM PHOSPHATE

CAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
86	1.800		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CALCIUM

CAM

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Solid	Silvery to grayish white	Odorless
	Sinks in water. Reacts slowly with water.		
Keep people away. Avoid contact with solid and dust. Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
Fire	FLAMMABLE. Extinguish with dry graphite, soda ash, or other inert powder. DO NOT USE WATER, FOAM, CARBON DIOXIDE OR VAPORIZING LIQUIDS ON FIRE.		
Exposure	Call for medical aid.  SOLID Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

1. CORRECTIVE RESPONSE ACTIONS Stop discharge Collection Systems: Pump; Dredge	2. CHEMICAL DESIGNATIONS 2.1 CG Compatibility Group: Not listed. 2.2 Formula: Ca 2.3 IMO/UN Designation: 4.3/1401 2.4 DOT ID No.: 1401 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: 138 2.7 Standard Industrial Trade Classification: 52229
3. HEALTH HAZARDS 3.1 Personal Protective Equipment: Goggles and rubber gloves. 3.2 Symptoms Following Exposure: Contact with eyes or skin produces caustic burns. 3.3 Treatment of Exposure: Flush with water 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Currently not available 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: None 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Odorless 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent (flammable solid)  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Dry graphite, soda ash, powdered sodium chloride, or appropriate metal fire extinguishing dry powder.  
4.4 Fire Extinguishing Agents Not to Be Used: Water, halogenated hydrocarbons, dry chemical, carbon dioxide, foam  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Burns violently, especially if finely divided.  
4.7 Auto Ignition Temperature: 1454+—18°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 2.4 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 1.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts to form flammable hydrogen gas, which may ignite. The reaction is not violent.  
5.2 Reactivity with Common Materials: Reacts with moist air to form skin of hydroxide. The reaction is not hazardous.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Flush with water  
5.5 Polymerization: Stable  
5.6 Inhibitor of Polymerization: Stable

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: See Calcium hydroxide (CAH)  
6.2 Waterfowl Toxicity: See Calcium hydroxide (CAH)  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 99.5%; redistilled 99.9%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Sealed containers must be in a ventilated area.  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Dangerous When Wet  
8.2 49 CFR Class: 4.3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	2
Special (White).....	W

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 40.1  
9.3 Boiling Point at 1 atm: 2,714°F = 1,490°C = 1,763°K  
9.4 Freezing Point: 1,562°F = 850°C = 1,123°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.55 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: -6790 Btu/lb = -3,770 cal/g = -158 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 55.7 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES



# CALCIUM

CAM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CALCIUM OXIDE

CAO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Quicklime Unslaked lime		Solid granules      White to grey      Odorless
		Sinks and reacts violently with water. Water appears to boil.
Keep people away. Avoid contact with solid. Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable. May cause fire on contact with water and combustibles. Extinguish adjacent fires with dry chemical or carbon dioxide. DO NOT USE WATER ON ADJACENT FIRES.	
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to nose and throat. Move to fresh air.  SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: CaO
- 2.3 IMO/UN Designation: 9.0/1910
- 2.4 DOT ID No.: 1910
- 2.5 CAS Registry No.: 1305-78-8
- 2.6 NAERG Guide No.: 157
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves, goggles, and any type of respirator prescribed for fine dust.
- 3.2 **Symptoms Following Exposure:** Causes burns on mucous membrane and skin. Inhalation of dust causes sneezing.
- 3.3 **Treatment of Exposure:** INGESTION: if victim is conscious, have him drink water or milk. DO NOT induce vomiting. SKIN AND EYES: flush with water and seek medical help.
- 3.4 **TLV-TWA:** 2 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 25 mg/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 5 mg/m<sup>3</sup>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Extinguish adjacent fires with dry chemical or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water on adjacent fires.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Heat may cause ignition of combustibles. Material swells during reaction.
- 5.2 **Reactivity with Common Materials:** No reaction unless water present, then chief effect is that of heat liberated.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
92 ppm/7 hr/trout/toxic/fresh water  
240 ppm/24 hr/mosquito fish/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Not pertinent
- 6.4 **Food Chain Concentration Potential:** Not pertinent
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 96-97%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	0
Instability (Yellow).....	1
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 56.08
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 3.3 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 218.1 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CALCIUM OXIDE

CAO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# P-CHLOROANILINE

CAP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Amino-4-chlorobenzene 4-Chloroaniline 4-Chlorophenylamine	Solid  Yellowish white  Mild sweet odor  Sinks and mixes slowly with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST. Wear rubber overclothing (including gloves) and dust respirator. Call fire department. Stay upwind. Use water spray to "knock down" dust. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	SOLID AND DUST POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 4-ClC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/2018  
2.4 DOT ID No.: 2018  
2.5 CAS Registry No.: 106-47-8  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification: 51453

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; chemical goggles; protective clothing; dust respirator.
- 3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes bluish tint to fingernails, lips, and ears indicative of cyanosis; headache, drowsiness, and nausea, followed by unconsciousness. Liquid can be absorbed through skin and cause similar symptoms. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure immediately; if needed, administer oxygen; refer to physician. EYES: flush with water for at least 15 min. SKIN: remove victim from exposure immediately; remove contaminated clothing; wash contacted area with copious amounts of water and soap; if needed, administer oxygen; refer to physician. INGESTION: induce vomiting; get medical attention.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 300 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
(Combustible solid) > 220°F O.C.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride and oxides of nitrogen may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 39.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.0%, Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester). Store containers in a well-ventilated area.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** P024
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 127.6
- 9.3 **Boiling Point at 1 atm:** 446°F = 230°C = 503°K
- 9.4 **Freezing Point:** 158°F = 70°C = 343°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.43 at 19°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -11,000 Btu/lb = -6,000 cal/g = -250 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# P-CHLOROANILINE

CAP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
86	0.400	150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400	0.028 0.038 0.052 0.069 0.092 0.120 0.157 0.202 0.260 0.331 0.418 0.526 0.657 0.815 1.006 1.235 1.508 1.831 2.213 2.662 3.188 3.800 4.512 5.334 6.282 7.370	150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400	0.00055 0.00074 0.00098 0.00129 0.00168 0.00217 0.00278 0.00354 0.00448 0.00562 0.00701 0.00869 0.01070 0.01310 0.01595 0.01932 0.02328 0.02792 0.03331 0.03957 0.04680 0.05511 0.06464 0.07551 0.08788 0.10190		N O T  P E R T I N E N T

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 3-Carene Isodiprene 3,7,7-Trimethylbicyclo[0, 1, 4]hept-3-ene 4,7,7-Trimethyl-3-norcarene	Liquid  Floats on water.	Colorless  	Sweet, turpentine-like odor
<b>Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.</b>			
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{10}H_{16}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 498-15-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51129

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister or air-supplied mask; goggles or face shield; rubber gloves
- 3.2 **Symptoms Following Exposure:** Inhalation causes headache, confusion, respiratory distress. Ingestion irritates entire digestive system and may injure kidneys; if liquid enters lungs, it causes severe pneumonitis. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air; call a doctor; administer artificial respiration and oxygen if required. INGESTION: give large amounts of water and induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off; wash with soap and water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat  $LD_{50} = 4.8$  g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective on fire.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 66.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Will attack some forms of plastics  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 136  
9.3 **Boiling Point at 1 atm:** 338°F = 170°C = 443°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.860 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** (est.) -19,370 Btu/lb = 10,760 cal/g = -450 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# CARENE

CAR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	54.770	N O T  P E R T I N E N T		51	1.048	68	1.200
44	54.680			52	1.048		
46	54.600			53	1.048		
48	54.520			54	1.048		
50	54.430			55	1.048		
52	54.350			56	1.048		
54	54.270			57	1.048		
56	54.180			58	1.048		
58	54.100			59	1.048		
60	54.020			60	1.048		
62	53.930			61	1.048		
64	53.850			62	1.048		
66	53.770			63	1.048		
68	53.680			64	1.048		
70	53.600			65	1.048		
72	53.520			66	1.048		
74	53.430			67	1.048		
76	53.350			68	1.048		
				69	1.048		
				70	1.048		
				71	1.048		
				72	1.048		
				73	1.048		
				74	1.048		
				75	1.048		
				76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		160	0.496	160	0.01014		N O T  P E R T I N E N T
		170	0.630	170	0.01268		
		180	0.795	180	0.01576		
		190	0.997	190	0.01944		
		200	1.240	200	0.02382		
		210	1.533	210	0.02900		
		220	1.883	220	0.03510		
		230	2.300	230	0.04225		
		240	2.792	240	0.05056		
		250	3.372	250	0.06020		
		260	4.051	260	0.07131		
		270	4.842	270	0.08406		
		280	5.759	280	0.09864		
		290	6.819	290	0.11520		
		300	8.037	300	0.13400		
		310	9.434	310	0.15530		
		320	11.030	320	0.17920		
		330	12.840	330	0.20600		

# CALCIUM ARSENITE

CAS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arsenous acid, calcium salt Calcium arsenite solid		Solid granular powder    White    Odorless
Keep people away. AVOID CONTACT WITH SOLID. Wear goggles, self-contained breathing apparatus, protective clothing, and gloves. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Poisonous if swallowed. Irritating to skin, eyes, and nose. Move to fresh air. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: Variable composition, CaAsO<sub>3</sub>H
- 2.3 IMO/UN Designation: 6.1/1574
- 2.4 DOT ID No.: 1574
- 2.5 CAS Registry No.: 52740-16-6
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 52499

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Hand and arm protection, protective clothing, waterproof boots, respiratory protective equipment, and eye protection.
- 3.2 **Symptoms Following Exposure:** INHALATION: Irritation of nose, laryngitis, bronchitis, huskiness of voice. Chronic exposure - perforation of nasal septum may occur. EYES: Irritation of conjunctiva, edema of eyelids may occur. Chronic exposure - conjunctivitis. SKIN: Skin eruptions and inflammation. Chronic exposure - irritation and occasionally ulceration. INGESTION: Dryness and irritation of mouth, difficulty in swallowing followed by vomiting, severe abdominal pain and diarrhea. Pain in limbs, headache, convulsions, muscular weakness and unconsciousness. Chronic exposure - weakness, loss of appetite, gastrointestinal disturbances, peripheral neuritis, occasionally hepatitis, and skin disorders such as keratitis and pigmentation.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Take victim to clean area. EYES: Flush with water. SKIN: Flush thoroughly with water. INGESTION: Induce vomiting, gastric lavage, catharsis. BAL given promptly.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 **Chronic Toxicity:** See 5.2 (Chronic exposure). Available studies point consistently to a causal relationship between skin cancer and heavy exposure to inorganic arsenic. An increased frequency of deaths from lung cancer has been found in occupational groups exposed to high levels of inorganic arsenic compounds.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Not pertinent
- 5.3 **Stability During Transport:** May decompose by atmospheric CO<sub>2</sub>. No hazardous decomposition.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Fish toxicity critical concentration 1 mg/l
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources:  
Human Oral hazard:  
Human Contact hazard:  
Reduction of amenities:

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 164.0
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** Currently not available
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# CALCIUM ARSENITE

CAS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CADMIUM ACETATE

CAT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cadmium acetate dihydrate	Solid  Colorless  Odorless  Sinks and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear dust respirator and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> Not listed. <b>2.2 Formula:</b> Cd(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) <sub>2</sub> ·2H <sub>2</sub> O <b>2.3 IMO/UN Designation:</b> Not listed <b>2.4 DOT ID No.:</b> 2570 <b>2.5 CAS Registry No.:</b> 543-90-8 <b>2.6 NAERG Guide No.:</b> 154 <b>2.7 Standard Industrial Trade Classification:</b> 51371
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Dust mask; goggles or face shield; rubber gloves <b>3.2 Symptoms Following Exposure:</b> Inhalation causes coughing, sneezing, symptoms of lung damage. Ingestion produces severe toxic symptoms; both kidney and liver injuries may occur. Contact with dust causes eye irritation. <b>3.3 Treatment of Exposure:</b> INHALATION: remove victim to fresh air; seek medical attention. INGESTION: induce vomiting; allay gastrointestinal irritation by swallowing milk or egg whites at frequent intervals; perform gastric lavage; seek medical attention. EYES: flush with water for at least 15 min. <b>3.4 TLV-TWA:</b> 0.01 mg Cd/m <sup>3</sup> inhalable; 0.002 mg Cd/m <sup>3</sup> respirable fraction. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 4; LD <sub>50</sub> <50 mg/kg <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Delayed liver, lung, and kidney damage has followed respiratory exposures to cadmium salts in industry. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Currently not available <b>3.11 Liquid or Solid Characteristics:</b> Currently not available <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> 9 mg/m <sup>3</sup> as Cd <b>3.14 OSHA PEL-TWA:</b> 0.005 mg/m <sup>3</sup> as Cd. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:**  
Not flammable
- 4.2 Flammable Limits in Air:** Not flammable
- 4.3 Fire Extinguishing Agents:** Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 Special Hazards of Combustion**  
**Products:** Toxic cadmium oxide fumes may form in fires.
- 4.6 Behavior in Fire:** Currently not available
- 4.7 Auto Ignition Temperature:** Not pertinent
- 4.8 Electrical Hazards:** Not pertinent
- 4.9 Burning Rate:** Not pertinent
- 4.10 Adiabatic Flame Temperature:** Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 Flame Temperature:** Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction
- 5.2 Reactivity with Common Materials:**  
Currently not available
- 5.3 Stability During Transport:** Stable
- 5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 Polymerization:** Not pertinent
- 5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
Currently not available
- 6.2 Waterfowl Toxicity:** Currently not available
- 6.3 Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 Food Chain Concentration Potential:**  
Concentrated by shellfish
- 6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Pure, 98%; Reagent
- 7.2 Storage Temperature:** Ambient
- 7.3 Inert Atmosphere:** No requirement
- 7.4 Venting:** Open
- 7.5 IMO Pollution Category:** Currently not available
- 7.6 Ship Type:** Currently not available
- 7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Poison
- 8.2 49 CFR Class:** 6.1
- 8.3 49 CFR Package Group:** II
- 8.4 Marine Pollutant:** Yes
- 8.5 NFPA Hazard Classification:** Not listed
- 8.6 EPA Reportable Quantity:** Not listed.
- 8.7 EPA Pollution Category:** Not listed.
- 8.8 RCRA Waste Number:** Not listed
- 8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Solid
- 9.2 Molecular Weight:** 266.52
- 9.3 Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 Freezing Point:** Not pertinent
- 9.5 Critical Temperature:** Not pertinent
- 9.6 Critical Pressure:** Not pertinent
- 9.7 Specific Gravity:** 2.34 at 20°C (solid)
- 9.8 Liquid Surface Tension:** Not pertinent
- 9.9 Liquid Water Interfacial Tension:** Not pertinent
- 9.10 Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 Latent Heat of Vaporization:** Not pertinent
- 9.13 Heat of Combustion:** Not pertinent
- 9.14 Heat of Decomposition:** Not pertinent
- 9.15 Heat of Solution:** Currently not available
- 9.16 Heat of Polymerization:** Not pertinent
- 9.17 Heat of Fusion:** Currently not available
- 9.18 Limiting Value:** Currently not available
- 9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# CADMIUM ACETATE

CAT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# COBALT ACETATE

CBA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cobalt(II) acetate Cobalt acetate tetrahydrate Cobaltous acetate	Solid  Pink  Vinegar-like odor  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Co}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 4\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 71-48-7
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51371

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; rubber gloves; goggles or face shield; protective clothing
- 3.2 **Symptoms Following Exposure:** Inhalation causes shortness of breath and coughing; permanent disability may occur. Ingestion causes pain and vomiting. Contact with eyes causes irritation. Contact with skin may cause dermatitis.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air; if breathing has stopped, begin artificial respiration. INGESTION: give large amounts of water; induce vomiting. EYES: flush with water for at least 15 min. SKIN: wash with soap and water.
- 3.4 **TLV-TWA:** 0.02 mg/m<sup>3</sup> (as cobalt)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50-500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 20 mg/m<sup>3</sup> as cobalt
- 3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as cobalt
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic cobalt oxide fumes may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Bioconcentration of 200-1000 fold only under constant exposure. Not significant in spill conditions.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; Reagent
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 249.1
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 284°F = 140°C = 413°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.71 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COBALT ACETATE

CBA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CARBON DISULFIDE

CBB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carbon bisulfide	Watery liquid  Colorless to yellow  Rotten egg to sweet odor  Sinks in water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical or carbon dioxide. Water and foam may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 38; Carbon disulfide  
2.2 Formula: CS<sub>2</sub>  
2.3 IMO/UN Designation: 3.1/1131  
2.4 DOT ID No.: 1131  
2.5 CAS Registry No.: 75-15-0  
2.6 NAERG Guide No.: 131  
2.7 Standard Industrial Trade Classification: 52242

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Only approved self-contained breathing mask with full face is recommended. If the vapor concentration exceeds 2% by volume or is unknown, supplied-air respiratory equipment of appropriate design with full face masks should be used by all persons entering contaminated area. Masks should be used only for emergency situations and should be located accordingly. Almost any type of industrial clothing is satisfactory. Splashes of small quantity are not harmful to fabrics, and evaporation from clothing is quite rapid. Clothing should, however, be removed and the skin washed with water. Goggles should be used when there is any danger of CS<sub>2</sub> splashes or spray.
- 3.2 **Symptoms Following Exposure:** ACUTE EXPOSURE: mild to moderate irritation of skin, eyes, and mucous membranes from liquid or concentrated vapors; headache, garlicky breath, nausea, vomiting, diarrhea (even after vapor exposures), and occasionally abdominal pain; weak pulse, palpitations; fatigue, weakness in the legs, unsteady gait, vertigo; mania, hallucinations of sight, hearing, taste, and smell in acute, massive vapor exposures; central nervous depression with respiratory paralysis; death may occur during coma
- 3.3 **Treatment of Exposure:** INHALATION: remove victim promptly from contaminated area. Administer oxygen and artificial respiration if needed. SKIN CONTACT: wash affected areas with copious quantities of water. INGESTION: induce vomiting and follow with gastric lavage and saline cathartics.
- 3.4 TLV-TWA: 10 ppm (skin)  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; rat LD<sub>50</sub> = 0.1 - 0.99 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Non-specific liver cell damage in rats; higher incidence of upper respiratory disease in humans.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** 0.21 ppm  
3.13 **IDLH Value:** 500 ppm  
3.14 **OSHA PEL-TWA:** 20 ppm.  
3.15 **OSHA PEL-STEL:** 100 ppm 30 minute peak per 8 hour shift.  
3.16 **OSHA PEL-Ceiling:** 30 ppm.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -22°F C.C.  
4.2 **Flammable Limits in Air:** 1.3%-50%  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective on fire.  
4.5 **Special Hazards of Combustion Products:** Toxic gases are generated; wear self-contained breathing apparatus.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 212°F  
4.8 **Electrical Hazards:** Contact of the liquid or vapor with the surface of a lighted electric light bulb could result in ignition.  
4.9 **Burning Rate:** 2.7 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 14.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 3.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 35 ppm/48 hr/mosquito fish/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; technical; USP  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Inerted  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: P022  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 76.14  
9.3 **Boiling Point at 1 atm:** 115°F = 46.3°C = 319.5°K  
9.4 **Freezing Point:** -168.9°F = -111.6°C = 161.6°K  
9.5 **Critical Temperature:** 523.4°F = 273°C = 546.2°K  
9.6 **Critical Pressure:** 1100 psia = 76 atm = 7.7 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.26 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 32 dynes/cm = .032 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 48.4 dynes/cm = .0484 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 2.6  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.292  
9.12 **Latent Heat of Vaporization:** 153 Btu/lb = 85 cal/g = 3.559 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -5814 Btu/lb = -3230 cal/g = -135.2 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 13.80 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 10.3 psia

### NOTES

# CARBON DISULFIDE

CBB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-30	83.719	-110	0.219	-110	1.030	35	0.421
-20	83.240	-100	0.220	-100	1.021	40	0.412
-10	82.750	-90	0.221	-90	1.012	45	0.403
0	82.270	-80	0.223	-80	1.003	50	0.395
10	81.780	-70	0.224	-70	0.994	55	0.387
20	81.299	-60	0.225	-60	0.985	60	0.379
30	80.809	-50	0.226	-50	0.976	65	0.371
40	80.320	-40	0.227	-40	0.967	70	0.364
50	79.841	-30	0.228	-30	0.958	75	0.357
60	79.349	-20	0.229	-20	0.950	80	0.351
70	78.870	-10	0.230	-10	0.941	85	0.344
80	78.379	0	0.231	0	0.932	90	0.338
90	77.900	10	0.233	10	0.923	95	0.332
100	77.410	20	0.234	20	0.914	100	0.326
110	76.929	30	0.235	30	0.905	105	0.321
		40	0.236	40	0.896	110	0.315
		50	0.237	50	0.887		
		60	0.238	60	0.878		
		70	0.239				
		80	0.240				
		90	0.241				
		100	0.243				
		110	0.244				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	15	1.595	15	0.02383	0	0.110
	N	20	1.821	20	0.02693	20	0.112
	S	25	2.074	25	0.03036	40	0.113
	O	30	2.356	30	0.03413	60	0.115
	L	35	2.670	35	0.03828	80	0.116
	U	40	3.017	40	0.04283	100	0.118
	B	45	3.402	45	0.04781	120	0.119
	L	50	3.826	50	0.05325	140	0.120
	E	55	4.294	55	0.05918	160	0.122
		60	4.808	60	0.06562	180	0.123
		65	5.372	65	0.07263	200	0.124
		70	5.990	70	0.08021	220	0.125
		75	6.665	75	0.08842	240	0.127
		80	7.402	80	0.09728	260	0.128
		85	8.204	85	0.10680	280	0.129
		90	9.076	90	0.11710	300	0.130
		95	10.020	95	0.12820	320	0.131
		100	11.050	100	0.14000	340	0.132
		105	12.160	105	0.15270	360	0.133
		110	13.360	110	0.16630	380	0.134
		115	14.650	115	0.18080	400	0.135
		120	16.040	120	0.19630	420	0.136
		125	17.540	125	0.21280	440	0.136
		130	19.150	130	0.23030		
		135	20.870	135	0.24900		
		140	22.720	140	0.26880		

# COBALT CHLORIDE

CBC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cobalt (II) chloride Cobaltous chloride Cobaltous chloride dihydrate Cobaltous chloride hexahydrate	Solid  Pink to red  Slight sharp odor  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CoCl}_2$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 7646-79-9
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; side-shield goggles; Bu. of Mines respirator; protective clothing
- 3.2 **Symptoms Following Exposure:** Inhalation causes respiratory disease, shortness of breath, and coughing; permanent disability may occur. Ingestion causes pain, vomiting, and diarrhea. Contact causes irritation of eyes and may cause skin rash.
- 3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air; if breathing has stopped, begin artificial respiration and call a doctor. INGESTION: give large amount of water; induce vomiting. EYES: flush with water at least 15 min.; consult physician if irritation persists. SKIN: flush with water.
- 3.4 **TLV-TWA:** 0.02 mg/m<sup>3</sup> (as cobalt)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50-500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 20 mg/m<sup>3</sup> as cobalt
- 3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as cobalt
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic cobalt oxide fumes may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1000 ppm/30-32 hr/goldfish/killed/fresh (hard) water  
10 ppm/168 hr/goldfish/killed/fresh (soft) water  
200 ppm\*/mummichogs/no effect/sea water  
\*Time period not specified.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Bioconcentration of 200-1000 fold only under constant exposure. Not significant in spill conditions.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Anhydrous, 100.1%. May also be shipped as dihydrate.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 237.9
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 187°F = 86°C = 359°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.924 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 22 Btu/lb = 12 cal/g = 0.50 X 10<sup>6</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 56.9 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# COBALT CHLORIDE

CBC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	44.020		N		N		N
36	44.540		O		O		O
38	45.070		T		T		T
40	45.590						
42	46.110		P		P		P
44	46.630		E		E		E
46	47.150		R		R		R
48	47.680		T		T		T
50	48.200		I		I		I
52	48.720		N		N		N
54	49.240		E		E		E
56	49.770		N		N		N
58	50.290		E		E		E
60	50.810		N		N		N
62	51.330		T		T		T
64	51.850						
66	52.380						
68	52.900						
70	53.420						
72	53.940						
74	54.470						
76	54.990						
78	55.510						
80	56.030						
82	56.550						
84	57.080						

# COPPER BROMIDE (OUS)

CBD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Copper monobromide	Solid powder or crystals  White turns green to dark blue on exposure to sunlight  Sinks and mixes slowly with water.
Keep people away. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. If swallowed will cause pain, nausea, and vomiting. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:** CuBr
- 2.3 **IMO/UN Designation:** Not listed
- 2.4 **DOT ID No.:** Not listed
- 2.5 **CAS Registry No.:** Currently not available
- 2.6 **NAERG Guide No.:** Not listed
- 2.7 **Standard Industrial Trade Classification:** 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, safety glasses, and laboratory coat.
- 3.2 **Symptoms Following Exposure:** INHALATION: Irritation of upper respiratory tract. EYES: Irritation of conjunctivae. SKIN: Irritation, acne-like rash (usually from prolonged exposure). INGESTION: Vomiting caused by local irritant and astringent action of ionic Cu on stomach and intestines. Pain in mouth, esophagus, and stomach. Inorganic bromides produce depression, psychoses, and mental deterioration.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove from exposure. EYES: Flush with copious amounts of water. SKIN: Wash with copious amounts of water. INGESTION: Dilute with water or milk, induce vomiting, give egg whites and other demulcents. Replace fluids with 5% dextrose in saline.
- 3.4 **TLV-TWA:** Notice of intended change: 0.05 mg/m<sup>3</sup> respirable particles as copper.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Inorganic bromides can cause depression, emaciation, and, in severe cases, psychoses and mental deterioration. An acne-like rash often occurs.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 100 mg Cu/m<sup>3</sup> (dusts, mists, and fumes)
- 3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as copper.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Currently not available
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Currently not available
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Keep tightly closed in a dark place.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
The toxicity varies significantly not only with species, but also with physical and chemical characteristics of the water. Concentrations from 0.015 to 3.0 mg/l Cu are toxic to many fish, crustacea, mollusks, insects, and plankton.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 8.4 to 35 mg/l Cu caused a 50% reduction in 5-day BOD
- 6.4 **Food Chain Concentration Potential:**  
Copper is concentrated by plankton by factors of 1000 to 5000 or more.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 143.46 286.91 for dimer (Cu<sub>2</sub>Br<sub>2</sub>)
- 9.3 **Boiling Point at 1 atm:** 2453°F = 1345°C = 1618.2°K
- 9.4 **Freezing Point:** 939.2°F = 504°C = 777.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 4.72 at 25°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** 16.03 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COPPER BROMIDE (OUS)

CBD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	1062	0.019		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# CARBOFURAN

CBF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Curater Furadan Methylcarbamate Niagara 10242		Solid, crystalline      White      Odorless  Mixes and sinks in water.
Keep people away. AVOID CONTACT WITH SOLID OR DUST. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	NOT FLAMMABLE. Irritating and poisonous fumes produced when heated. Will support combustion if ignited. Wear goggles and self-contained breathing apparatus.	
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST OR SOLID. Poisonous if inhaled or swallowed. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE AT VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Contain  
 Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula: C<sub>12</sub>H<sub>6</sub>NO<sub>3</sub>.  
 2.3 IMO/UN Designation: 6.1/2757  
 2.4 DOT ID No.: 2757  
 2.5 CAS Registry No.: 1563-66-2  
 2.6 NAERG Guide No.: 151  
 2.7 Standard Industrial Trade Classification: 59110

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles and recommended mask or respirator, nonpermeable protective clothing, rubber gloves.
- 3.2 **Symptoms Following Exposure:** INHALATION, INGESTION OR SKIN ABSORPTION: Early symptoms - headache, light-headedness, weakness and nausea. Later symptoms - constriction of pupils, blurred vision, abdominal cramps, excessive salivation, perspiration and vomiting. EYES: Burning sensation and dimming of vision, miosis and loss of accommodation.
- 3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from exposure. Administer 2 mg atropine sulfate 1 M or oral. If indicated, give artificial respiration and oxygen. EYES: Irrigate with water or saline. One drop of homatropine into conjunctival sac will relieve miosis and loss of accommodation. SKIN: Wash with soap and water followed by alcohol washing and a final soap washing. INGESTION: Induce vomiting by giving a tablespoon of salt in a glass of warm water. Repeat until vomitus is clear. Gastric lavage or syrup of ipecac may be warranted if vomiting is not prompt and profuse.
- 3.4 TLV-TWA: 0.1 mg/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> less than 50 mg/kg.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Prenatal exposure initiated persistent postnatal endocrine dysfunction in mice. As a rapidly reversible inhibitor of cholinesterase it has no chronic effects. A suspected carcinogen.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless skin.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
 Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable.
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic fumes of nitrogen oxides.
- 4.6 **Behavior in Fire:** Very toxic dust and irritating fumes produced at fire temperatures.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 0.24 ppm/96 hr/Bluegill/LC<sub>50</sub>/static  
 0.21 ppm/96 hr/Channel catfish/LC<sub>50</sub>/static  
 0.28 ppm/96 hr/Rainbow trout/LC<sub>50</sub>/static
- 6.2 **Waterfowl Toxicity:** 10 day Mallard oral LC<sub>50</sub> = 190 ppm. Acute oral LC<sub>50</sub>, 36 hr old = .370 mg/kg. Acute oral LD<sub>50</sub> Mallard, 7 days old = .628 mg/kg. Acute oral LD<sub>50</sub> Mallard, 30 days old = .5510 mg/kg. Acute oral LD<sub>50</sub> Mallard, 6 mos. old = .415 mg/kg.
- 6.3 **Biological Oxygen Demand (BOD):** May effect BOD.
- 6.4 **Food Chain Concentration Potential:**  
 None
- 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 4  
 Human Oral hazard: 4  
 Human Contact hazard: II  
 Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical 98%, 10% granular formulation, 50, 75 or 80% wettable powder, 4 lb/gal flowable paste.
- 7.2 **Storage Temperature:** Keep away from heat and water.
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 221.26.
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** 302-307.4°F = 150-153°C = 423.2-426.2°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.180 at 20°C.
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** (est.) 7.9.
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) >1
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CARBOFURAN

CBF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	700.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 4-CHLOROBUTYRONITRILE

CBN

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid White to light yellow

Sinks in water.

Keep people away.  
Call fire department.  
Avoid contact with liquid.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Combustible.  
POISONOUS GASES MAY BE PRODUCED IN FIRE.  
Irritating gases may be produced when heated.  
Wear goggles and self-contained breathing apparatus.  
Extinguish with water, dry chemicals, foam, or carbon dioxide.

### Exposure

CALL FOR MEDICAL AID.

#### VAPOR

Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

#### LIQUID

Irritating to skin and eyes.  
If swallowed will cause nausea and vomiting.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump; Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_2\text{ClCH}_2\text{CH}_2\text{CN} + \text{CH}_2\text{BrCH}_2\text{CH}_2\text{CN}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51484

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Air supply mask or self-contained breathing apparatus for repeated handling large amounts; rubber gloves; safety goggles  
3.2 Symptoms Following Exposure: Chemical is moderately toxic. Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation. Can penetrate the skin on prolonged contact; only slightly irritating.  
3.3 Treatment of Exposure: INHALATION: move victim to fresh air; administer artificial respiration if required; call a doctor. INGESTION: give large amount of water; induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with plenty of water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3;  $\text{LD}_{50} = 50\text{-}400 \text{ mg/kg (rat)}$   
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Currently not available  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Water, dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Toxic and irritating hydrogen cyanide, hydrogen bromide, and hydrogen chloride may form in fires.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 29.8 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 9.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: May attack some forms of plastics.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 50%, + 40% 4-bromobutyronitrile + 8% glutaronitrile. Major components have same hazard ratings.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 103.55  
9.3 Boiling Point at 1 atm: 374°F = 190°C = 463°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.22 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 3.57  
9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.080 at 20°C  
9.12 Latent Heat of Vaporization: (est.) 185 Btu/lb = 103 cal/g = 4.31 X 10<sup>3</sup> J/kg  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# 4-CHLOROBUTYRONITRILE

CBN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	77.059		N O T		N O T		N O T
44	76.990						
46	76.919						
48	76.849						
50	76.780		P		P		P
52	76.709		E		E		E
54	76.639		R		R		R
56	76.570		T		T		T
58	76.500		I				
60	76.429		N				
62	76.360		E				
64	76.290		N				
66	76.219		T				
68	76.150						
70	76.089						
72	76.020						
74	75.950						
76	75.879						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	160	0.202	160	0.00315	0	0.240
	N	170	0.263	170	0.00404	20	0.246
	S	180	0.341	180	0.00514	40	0.252
	O	190	0.437	190	0.00649	60	0.258
	L	200	0.556	200	0.00814	80	0.263
	U	210	0.703	210	0.01013	100	0.269
	B	220	0.883	220	0.01253	120	0.274
	L	230	1.101	230	0.01540	140	0.280
	E	240	1.365	240	0.01881	160	0.285
		250	1.681	250	0.02285	180	0.290
		260	2.058	260	0.02759	200	0.295
		270	2.507	270	0.03314	220	0.301
		280	3.037	280	0.03960	240	0.306
		290	3.660	290	0.04709	260	0.311
		300	4.389	300	0.05573	280	0.316
		310	5.239	310	0.06566	300	0.320
		320	6.225	320	0.07701	320	0.325
		330	7.364	330	0.08996	340	0.330
		340	8.675	340	0.10460	360	0.335
		350	10.180	350	0.12130	380	0.339
		360	11.900	360	0.14000	400	0.344
		370	13.850	370	0.16100	420	0.348
						440	0.352
						460	0.357
						480	0.361
						500	0.365

# CARBOLIC OIL (MIXTURE)

CBO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carbolic acid Liquefied phenol Middle oil	Liquid  Colorless - darkens on exposure to light  Sweet tar odor  Sinks and mixes with water.
Evacuate. Keep people away. AVOID CONTACT WITH LIQUID. Wear chemical protective suit with self-contained breathing apparatus. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear chemical protective suit with self-contained breathing apparatus. Extinguish with water, dry chemical, foam or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 21; Phenols, cresols  
**2.2 Formula:** C<sub>6</sub>H<sub>5</sub>OH  
**2.3 IMO/UN Designation:** 9.0/2821  
**2.4 DOT ID No.:** 2821  
**2.5 CAS Registry No.:** 108-95-2  
**2.6 NAERG Guide No.:** 153  
**2.7 Standard Industrial Trade Classification:** 51241

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Fresh air mask for confined areas; rubber gloves; protective clothing; full face shield  
**3.2 Symptoms Following Exposure:** Will burn eyes and skin. The analgesic action may cause loss of pain sensation. Readily absorbed through skin, causing increased heart rate, convulsions, and death.  
**3.3 Treatment of Exposure:** INHALATION: remove victim to fresh air, keep quiet and warm. If breathing stops, start artificial respiration. INGESTION: do NOT induce vomiting. Give milk, egg whites, or large amounts of water. Get medical assistance. No known antidote. EYES AND SKIN: remove contaminated clothing. Flush eyes with water for 15 minutes or until physician arrives. Wash skin with soap and water.  
**3.4 TLV-TWA:** 5 ppm  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Causes cancer in experimental animals.  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.  
**3.12 Odor Threshold:** 0.05 ppm  
**3.13 IDLH Value:** 250 ppm  
**3.14 OSHA PEL-TWA:** 5 ppm  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 185°F O.C. 175°F C.C.  
**4.2 Flammable Limits in Air:** 1.7%-8.6%  
**4.3 Fire Extinguishing Agents:** Water, dry chemical, foam, or carbon dioxide  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion Products:** Unburned vapor is toxic  
**4.6 Behavior in Fire:** Yields flammable vapors when heated, which will form explosive mixtures with air  
**4.7 Auto Ignition Temperature:** 1319°F  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** 3.5 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
11.5-28.5mg/1/96 hr/bluegill/TL<sub>m</sub>/fresh water  
1.5 ppm/48 hr/rainbow trout/TL<sub>m</sub>/fresh water  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** 200%, 5 days  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 90-92% phenol; 80-82% phenol (Remainder consists of cresols and water)  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Pressure-vacuum  
**7.5 IMO Pollution Category:** A  
**7.6 Ship Type:** 2  
**7.7 Barge Hull Type:** 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Poison  
**8.2 49 CFR Class:** 6.1  
**8.3 49 CFR Package Group:** II  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 94.11  
**9.3 Boiling Point at 1 atm:** 359.2°F = 181.8°C = 455.0°K  
**9.4 Freezing Point:** <105.6°F = <40.9°C = <314.1°K  
**9.5 Critical Temperature:** 790.0°F = 421.1°C = 694.3°K  
**9.6 Critical Pressure:** 889 psia = 60.5 atm = 6.13 MN/m<sup>2</sup>  
**9.7 Specific Gravity:** 1.04 at 41°C (liquid)  
**9.8 Liquid Surface Tension:** 41 dynes/cm = 0.041 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** Not pertinent  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** 1.089  
**9.12 Latent Heat of Vaporization:** 129.6 Btu/lb = 72.0 cal/g = 3.014 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -13,401 Btu/lb = -7445 cal/g = -311.707 X 10<sup>3</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** 28.67 cal/g  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 0.03 psia

### NOTES



# CARBOLIC OIL (MIXTURE)

CBO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
110	65.030	C U R R E N T L Y  N O T  A V A I L A B L E		122	1.113	110	4.302
115	64.900					115	3.929
120	64.759					120	3.594
125	64.629					125	3.292
130	64.500					130	3.021
135	64.370					135	2.775
140	64.250					140	2.554
145	64.120					145	2.353
150	63.990					150	2.171
155	63.860					155	2.005
160	63.740					160	1.855
165	63.610					165	1.718
170	63.490					170	1.593
175	63.360					175	1.479
180	63.240						
185	63.120						
190	63.000						
195	62.870						
200	62.750						
205	62.630						
210	62.510						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	8.400	70	0.012	70	0.00019	0	0.224
		80	0.017	80	0.00027	25	0.237
		90	0.024	90	0.00039	50	0.250
		100	0.034	100	0.00054	75	0.262
		110	0.048	110	0.00074	100	0.274
		120	0.066	120	0.00100	125	0.286
		130	0.091	130	0.00135	150	0.297
		140	0.123	140	0.00180	175	0.309
		150	0.165	150	0.00238	200	0.319
		160	0.220	160	0.00311	225	0.330
		170	0.289	170	0.00403	250	0.341
		180	0.378	180	0.00518	275	0.351
		190	0.490	190	0.00661	300	0.360
		200	0.629	200	0.00836	325	0.370
		210	0.802	210	0.01050	350	0.379
		220	1.016	220	0.01311	375	0.388
		230	1.278	230	0.01624	400	0.397
		240	1.596	240	0.02000	425	0.405
		250	1.982	250	0.02449	450	0.414
		260	2.446	260	0.02980	475	0.422
		270	3.002	270	0.03607	500	0.429
		280	3.663	280	0.04342	525	0.436
		290	4.446	290	0.05200	550	0.444
		300	5.370	300	0.06197	575	0.450
		310	6.453	310	0.07350	600	0.457
		320	7.718	320	0.08679		

# CYANOGEN BROMIDE

CBR

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid crystals      Colorless      Penetrating odor

Sinks and mixes with water.

Evacuate.  
Keep people away. **AVOID CONTACT WITH SOLID.**  
Wear chemical protective suit with self-contained breathing apparatus.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
POISONOUS GASES ARE PRODUCED WHEN HEATED.  
Wear chemical protective suit with self-contained breathing apparatus.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
POISONOUS IF INHALED OR IF SKIN IS EXPOSED.  
Irritating to eyes.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.  
  
SOLIDS  
POISONOUS IF SWALLOWED.  
Will burn skin and eyes.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
DO NOT INDUCE VOMITING.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: BrCN  
2.3 IMO/UN Designation: 6.1/1889  
2.4 DOT ID No.: 1889  
2.5 CAS Registry No.: 506-68-3  
2.6 NAERG Guide No.: 157  
2.7 Standard Industrial Trade Classification: 52381

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical cartridge respirator, goggles, protective clothing, rubber gloves
- 3.2 **Symptoms Following Exposure:** Same symptoms as hydrogen cyanide. Because it irritates the eyes, throat, and lungs severely, it is unlikely that anyone would voluntarily remain in areas with a high enough concentration to exert a cyanide effect.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: remove victim to fresh air; if he is not breathing, give artificial respiration, preferably mouth-to-mouth; if symptoms of cyanide poisoning are observed, administer amyl nitrite as instructed for HCN. INGESTION: have victim drink water or milk; do NOT induce vomiting.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available.  
3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Workers exposed to solutions may develop dermatitis.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact; very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Poison gases are produced in fire.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Strong bleaching powder solution; let stand 24 hr.
- 5.5 **Polymerization:** Does not occur
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: Yes
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 2              |
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: U246
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 105.93
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** 120 to 124°F = 49 to 51°C = 322 to 324°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.015 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 3.6
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# CYANOGEN BROMIDE

CBR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# COBALT SULFATE

CBS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bieberite Cobaltous sulfate heptahydrate Cobalt(II) sulfate		Solid  Rose-pink  Odorless
Sinks and mixes with water.		
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.	
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 10124-43-3
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52349

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Bu. Mines approved respirator; goggles; protective gloves
- 3.2 **Symptoms Following Exposure:** Inhalation causes shortness of breath and coughing; permanent disability may occur. Ingestion causes pain and vomiting. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air; if breathing has stopped, begin artificial respiration and call a doctor. INGESTION: give large amount of water; induce vomiting; call a doctor. EYES: flush with water for at least 15 min.; consult a physician if irritation persists. SKIN: flush with water.
- 3.4 **TLV-TWA:** 0.02 mg/m<sup>3</sup> (as cobalt)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50-500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 20 mg/m<sup>3</sup> as cobalt
- 3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as cobalt
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic cobalt oxide fumes may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
10 ppm\*/\*\*/stickleback/lethal/fresh water  
\* As cobalt  
\*\* Time period not specified.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Bioconcentration of 200-1000 fold only under constant exposure. Not significant in spill conditions.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; reagent; may also be shipped as a monohydrate or hexahydrate.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 281.1
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.948 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 23 Btu/lb = 13 cal/g = 0.54 X 10<sup>6</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COBALT SULFATE

CBS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	25.240		N		N		N
36	25.790		O		O		O
38	26.330		T		T		T
40	26.880						
42	27.420		P		P		P
44	27.970		E		E		E
46	28.510		R		R		R
48	29.050		T		T		T
50	29.600		I		I		I
52	30.140		N		N		N
54	30.690		E		E		E
56	31.230		N		N		N
58	31.780		E		E		E
60	32.320		N		N		N
62	32.870		T		T		T
64	33.410						
66	33.950						
68	34.500						
70	35.040						
72	35.590						
74	36.130						
76	36.680						
78	37.220						
80	37.770						
82	38.310						
84	38.850						

# CARBON TETRACHLORIDE

CBT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzinoform Carbon tet Necatorina Perchloromethane Tetrachloromethane	Watery liquid	Colorless	Sweet odor
Sinks in water. Poisonous vapor is produced.			
<b>Keep people away. Avoid contact with liquid and vapor.</b> <b>Wear goggles and self-contained breathing apparatus.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Not flammable. POISONOUS AND IRRITATING GASES ARE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 36; 2.2 Formula: CCl <sub>4</sub> 2.3 IMO/UN Designation: 6.1/1846 2.4 DOT ID No.: 1846 2.5 CAS Registry No.: 56-23-5 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 51136
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Organic vapor canister with full face mask; protective clothing; rubber gloves. 3.2 <b>Symptoms Following Exposure:</b> Dizziness, incoordination, anesthesia; may be accompanied by nausea and liver damage. Kidney damage also occurs, often producing decrease or stopping of urinary output. 3.3 <b>Treatment of Exposure:</b> EYES AND SKIN: flush with plenty of water; for eyes, get medical attention. Remove contaminated clothing and wash before reuse. INHALATION: immediately remove to fresh air, keep patient warm and quiet and get medical attention promptly. Start artificial respiration if breathing stops. INGESTION: induce vomiting and get medical attention promptly. No specific antidote known. 3.4 TLV-TWA: 5 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: 10 ppm 3.7 Toxicity by Ingestion: Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg (rat) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Causes severe liver damage and death if ingested. 3.10 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 3.12 Odor Threshold: Greater than 10 ppm 3.13 IDLH Value: 200 ppm 3.14 OSHA PEL-TWA: 10 ppm 3.15 OSHA PEL-STEL: 200 ppm, 5 minute peak in any 4 hours. 3.16 OSHA PEL-Ceiling: 25 ppm. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Forms poisonous phosgene gas when exposed to open flames.  
4.6 Behavior in Fire: Decomposes to form chlorine and phosgene  
4.7 Auto Ignition Temperature: Not flammable  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not flammable  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not Pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not Pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial; technical; USP  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Pressure-vacuum  
7.5 IMO Pollution Category: B  
7.6 Ship Type: 3  
7.7 Barge Hull Type: 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: U211  
8.9 EPA FWPCA List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 153.83  
9.3 Boiling Point at 1 atm: 170°F = 76.5°C = 349.7°K  
9.4 Freezing Point: -9.4°F = -23.0°C = 250.2°K  
9.5 Critical Temperature: 541.4°F = 283°C = 556.2°K  
9.6 Critical Pressure: 660 psia = 45 atm = 4.6 MN/m<sup>2</sup>  
9.7 Specific Gravity: 1.59 at 20°C (liquid)  
9.8 Liquid Surface Tension: 27.0 dynes/cm = 0.027 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: 45.0 dynes/cm = 0.045 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: 5.3  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.111  
9.12 Latent Heat of Vaporization: 84.2 Btu/lb = 46.8 cal/g = 1.959 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 5.09 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 3.8 psia

## NOTES

# CARBON TETRACHLORIDE

CBT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	101.700	35	0.201	30	0.724	35	1.307
40	101.400	40	0.203	40	0.715	40	1.247
45	101.099	45	0.206	50	0.707	45	1.192
50	100.700	50	0.208	60	0.698	50	1.140
55	100.400	55	0.210	70	0.690	55	1.091
60	100.099	60	0.212	80	0.682	60	1.045
65	99.750	65	0.215	90	0.673	65	1.001
70	99.410	70	0.217	100	0.665	70	0.961
75	99.080	75	0.219	110	0.656	75	0.922
80	98.740	80	0.221	120	0.648	80	0.886
85	98.410	85	0.223	130	0.640	85	0.852
90	98.070	90	0.226	140	0.631	90	0.820
95	97.730	95	0.228	150	0.623	95	0.790
100	97.389	100	0.230	160	0.615	100	0.761
105	97.059	105	0.232	170	0.606	105	0.734
110	96.719	110	0.235			110	0.708
115	96.379	115	0.237			115	0.683
120	96.040	120	0.239			120	0.660
		125	0.241			125	0.638
		130	0.243			130	0.617
		135	0.246			135	0.597
		140	0.248			140	0.578

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.080	40	0.815	40	0.02339	0	0.123
		50	1.088	50	0.03059	25	0.126
		60	1.435	60	0.03958	50	0.128
		70	1.874	70	0.05069	75	0.130
		80	2.422	80	0.06431	100	0.132
		90	3.102	90	0.08087	125	0.134
		100	3.937	100	0.10080	150	0.136
		110	4.956	110	0.12470	175	0.138
		120	6.190	120	0.15300	200	0.139
		130	7.672	130	0.18650	225	0.141
		140	9.442	140	0.22560	250	0.143
		150	11.540	150	0.27130	275	0.144
		160	14.010	160	0.32410	300	0.145
		170	16.910	170	0.38500	325	0.147
		180	20.300	180	0.45470	350	0.148
		190	24.210	190	0.53410	375	0.149
		200	28.740	200	0.62430	400	0.150
		210	33.930	210	0.72610	425	0.151
						450	0.152
						475	0.152
						500	0.153
						525	0.153
						550	0.154
						575	0.154
						600	0.155

# CARBARYL

CBY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Naphthyl n-methylcarbamate Sevin		Solid powder, or in solution	White to gray	Weak odor
		Solid sinks in water; solution may float on water.		
Call fire department. Avoid contact with solid and solution. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Solid not flammable, but usually dissolved in combustible liquid. Extinguish with water, foam, dry chemical or carbon dioxide.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR SOLUTION Irritating to skin and eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Collection Systems: Dredge  
 Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula: C<sub>10</sub>H<sub>7</sub>NO<sub>2</sub>  
 2.3 IMO/UN Designation: 6.1/2757  
 2.4 DOT ID No.: 2757  
 2.5 CAS Registry No.: 63-25-2  
 2.6 NAERG Guide No.: 151  
 2.7 Standard Industrial Trade Classification: 59110

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Currently not available  
 3.2 Symptoms Following Exposure: Currently not available  
 3.3 Treatment of Exposure: SKIN AND EYE CONTACT: flood affected tissues with water. INGESTION: induce vomiting.  
 3.4 TLV-TWA: 5 mg/m<sup>3</sup>  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat LD<sub>50</sub> 0.51 g/kg)  
 3.8 Toxicity by Inhalation: Currently not available.  
 3.9 Chronic Toxicity: Liver damage to rats at high dose by mouth.  
 3.10 Vapor (Gas) Irritant Characteristics: None  
 3.11 Liquid or Solid Characteristics: No hazard  
 3.12 Odor Threshold: Currently not available  
 3.13 IDLH Value: 100 mg/m<sup>3</sup>  
 3.14 OSHA PEL-TWA: 5 mg/m<sup>3</sup>  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: Not flammable  
 4.2 Flammable Limits in Air: Not flammable  
 4.3 Fire Extinguishing Agents: Solution fires; Water, foam, dry chemical, CO<sub>2</sub>  
 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
 4.5 Special Hazards of Combustion Products: Not pertinent  
 4.6 Behavior in Fire: Not pertinent  
 4.7 Auto Ignition Temperature: Not flammable  
 4.8 Electrical Hazards: Not pertinent  
 4.9 Burning Rate: Not flammable  
 4.10 Adiabatic Flame Temperature: Currently not available  
 4.11 Stoichiometric Air to Fuel Ratio: Not Pertinent  
 4.12 Flame Temperature: Currently not available  
 4.13 Combustion Molar Ratio (Reactant to Product): Not Pertinent  
 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
 5.2 Reactivity with Common Materials: No reaction  
 5.3 Stability During Transport: Stable  
 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
 5.5 Polymerization: Not pertinent  
 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: 5.5 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water  
 0.013 ppm/48 hr/white shrimp/TL<sub>50</sub>/salt water  
 Toxic to shrimp and crab species  
 6.2 Waterfowl Toxicity: LD<sub>50</sub> = 2179 mg/kg  
 6.3 Biological Oxygen Demand (BOD): Currently not available  
 6.4 Food Chain Concentration Potential: None observed  
 6.5 GESAMP Hazard Profile:  
 Bioaccumulation: 0  
 Damage to living resources: 4  
 Human Oral hazard: 2  
 Human Contact hazard: II  
 Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Sevin 50 W wettable powder  
 Sevin sprayable 80% powder Sevin 4 oil  
 7.2 Storage Temperature: Currently not available  
 7.3 Inert Atmosphere: Currently not available  
 7.4 Venting: Currently not available  
 7.5 IMO Pollution Category: Currently not available  
 7.6 Ship Type: Currently not available  
 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Keep Away From Food  
 8.2 49 CFR Class: 6.1  
 8.3 49 CFR Package Group: III  
 8.4 Marine Pollutant: Yes  
 8.5 NFPA Hazard Classification: Not listed  
 8.6 EPA Reportable Quantity: 100 pounds  
 8.7 EPA Pollution Category: B  
 8.8 RCRA Waste Number: U279  
 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Solid  
 9.2 Molecular Weight: Not pertinent  
 9.3 Boiling Point at 1 atm: Not pertinent  
 9.4 Freezing Point: 288°F = 142°C = 415°K  
 9.5 Critical Temperature: Not pertinent  
 9.6 Critical Pressure: Not pertinent  
 9.7 Specific Gravity: 1.23 at 20°C (solid)  
 9.8 Liquid Surface Tension: Not pertinent  
 9.9 Liquid Water Interfacial Tension: Not pertinent  
 9.10 Vapor (Gas) Specific Gravity: Not pertinent  
 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
 9.12 Latent Heat of Vaporization: Not pertinent  
 9.13 Heat of Combustion: Not pertinent  
 9.14 Heat of Decomposition: Not pertinent  
 9.15 Heat of Solution: Not pertinent  
 9.16 Heat of Polymerization: Not pertinent  
 9.17 Heat of Fusion: Currently not available  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: Currently not available

### NOTES



# CARBARYL

CBY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CALCIUM ARSENATE

CCA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cucumber dust Tricalcium arsenate Tricalcium ortho arsenate	Solid  White  Odorless   Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear a dust respirator. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Contain

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Ca}_3(\text{AsO}_4)_2$
- 2.3 IMO/UN Designation: 6.1/1573
- 2.4 DOT ID No.: 1573
- 2.5 CAS Registry No.: 7778-44-1
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 52499

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves.
- 3.2 **Symptoms Following Exposure:** Inhalation causes respiratory irritation. Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give victim one tablespoonful of salt in glass of water; repeat until vomit is clear; then give 2 tablespoonfuls of Epsom salts or milk of magnesia and force fluids; call a physician in all cases of suspected poisoning. EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; oral rat  $\text{LD}_{50} = 20 \text{ mg/kg}$
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Arsenic compounds may cause skin and lung cancer.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:**  $5 \text{ mg/m}^3$  as Arsenic
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic arsenic fume may be formed in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 $1.1 \text{ ppm/48 hr/perch/toxic/fresh water}$   
 $4.3 \text{ ppm/264 hr/crabs/toxic/fresh water}$
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Possible bioaccumulation problem
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 3  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 70%, containing calcium carbonate and calcium hydroxide (limestone and slaked lime)
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** ii
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 398
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 3.62 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CALCIUM ARSENATE

CCA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.013		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CALCIUM CARBIDE

CCB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetylenogen Carbide		Solid granules      Grey to bluish black      Garlic odor
		Sinks in water, and bubbles appear on surface as flammable gas is produced.
Evacuate. Shut off ignition sources and call fire department. Keep people away. Avoid contact with solid and gas. Stay upwind. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable. FLAMMABLE, EXPLOSIVE GAS IS PRODUCED ON CONTACT WITH WATER. Let fire burn. DO NOT USE WATER OR FOAM ON ADJACENT FIRES.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Notify local health and wildlife officials.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CaC}_2$   
2.3 IMO/UN Designation: 4.3/1402  
2.4 DOT ID No.: 1402  
2.5 CAS Registry No.: 75-20-7  
2.6 NAERG Guide No.: 138  
2.7 Standard Industrial Trade Classification: 52493

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles and (for those exposed to unusually dusty operations) a respirator such as those approved by the U.S. Bureau of Mines for "nuisance dusts."
- 3.2 **Symptoms Following Exposure:** Eye and skin irritation
- 3.3 **Treatment of Exposure:** INHALATION OF DUST: remove from further exposure and call a doctor.  
SKIN: wash with plenty of water. EYES: flush with clean running water at an eye wash fountain for at least 15 min. and get medical attention.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Not pertinent  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** None  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Dry powder: preferably allow fire to burn
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, vaporizing liquid or foam, carbon dioxide
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** If wet by water, highly flammable acetylene gas is formed.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously with water to form the highly flammable acetylene gas, which may ignite spontaneously.
- 5.2 **Reactivity with Common Materials:**  
Reacts with copper and brass to form explosive compound.
- 5.3 **Stability During Transport:** Stable in absence of moisture
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Not pertinent
- 6.2 **Waterfowl Toxicity:** Not pertinent
- 6.3 **Biological Oxygen Demand (BOD):** Not pertinent
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Dangerous When Wet
- 8.2 **49 CFR Class:** 4.3
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 4              |
| Instability (Yellow)..... | 2              |
| Special (White).....      | W              |
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 64.10
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.22 at 18°C(solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CALCIUM CARBIDE

CCB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CALCIUM CHLORATE

CCC

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid White Odorless

Sinks and mixes with water.

Evacuate.  
Keep people away.  
Shut off ignition sources and call fire department.  
Avoid contact with solid and dust.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
May explode on contact with combustibles.  
Irritating gases may be produced when heated.  
Combat fires from safe distance or protected location.  
Flood discharge area with water.

### Exposure

Call for medical aid.  
DUST  
Irritating to eyes, nose and throat.  
Move victim to fresh air.  
If in eyes, hold eyelids open and flush with plenty of water.

SOLID  
Irritating to skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Ca}(\text{ClO}_3)_2$
- 2.3 IMO/UN Designation: 5.1/1452
- 2.4 DOT ID No.: 1452
- 2.5 CAS Registry No.: 10137-74-3
- 2.6 NAERG Guide No.: 140
- 2.7 Standard Industrial Trade Classification: 52339

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; dust respirator; coveralls or other protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of upper respiratory system. Dust irritates eyes and skin. Ingestion causes abdominal pain, nausea, vomiting, diarrhea, pallor, shortness of breath, unconsciousness.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: induce vomiting and get medical attention.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 4,500 \text{ mg/kg (rat)}$
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable but may cause fire with other materials.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Flood with water.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** When involved in a fire, may cause an explosion. Irritating gases may be generated when heated.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** May form an explosive mixture with finely divided combustible material. The mixture may ignite when rubbed.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial. May be shipped as dihydrate.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 207
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:**  $644^{\circ}\text{F} = 340^{\circ}\text{C} = 613^{\circ}\text{K}$
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.710 at 0°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.)  $-54 \text{ Btu/lb} = -30 \text{ cal/g} = -1.3 \times 10^5 \text{ J/kg}$
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# CALCIUM CHLORATE

CCC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	60.240		N		N		N
36	60.490		O		O		O
38	60.730		T		T		T
40	60.980						
42	61.220		P		P		P
44	61.470		E		E		E
46	61.710		R		R		R
48	61.960		T		T		T
50	62.200		I		I		I
52	62.440		N		N		N
54	62.690		E		E		E
56	62.930		N		N		N
58	63.180		E		E		E
60	63.420		N		N		N
62	63.670		T		T		T
64	63.910						
66	64.160						
68	64.400						
70	64.639						
72	64.889						
74	65.129						
76	65.379						
78	65.620						
80	65.870						
82	66.110						
84	66.360						

# CYCLOHEXANONE

CCH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Anone Cyclohexyl ketone Hytrol O Nadone Pimelic ketone Sextone	Watery liquid      Colorless to light yellow      Sweet, peppermint odor  Floats and mixes slowly with water.
Keep people away. Avoid contact with liquid. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Contain  
 Collection Systems: Skim  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 18; Ketone  
 2.2 Formula: (CH<sub>2</sub>)<sub>6</sub>CO  
 2.3 IMO/UN Designation: 3.3/1915  
 2.4 DOT ID No.: 1915  
 2.5 CAS Registry No.: 108-94-1  
 2.6 NAERG Guide No.: 127  
 2.7 Standard Industrial Trade Classification: 51628

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Chemical goggles.  
 3.2 **Symptoms Following Exposure:** Inhalation of vapors from hot material can cause narcosis. The liquid may cause dermatitis.  
 3.3 **Treatment of Exposure:** Immediately flush eyes with plenty of water; call a physician.  
 3.4 **TLV-TWA:** 25 ppm  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.  
 3.12 **Odor Threshold:** 0.12 ppm  
 3.13 **IDLH Value:** 700 ppm  
 3.14 **OSHA PEL-TWA:** 50 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 129°F O.C. 111°F C.C.  
 4.2 **Flammable Limits in Air:** 1.1%-9.4%  
 4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, or carbon dioxide.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 788°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 4.2 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 1  
 Human Oral hazard: 1  
 Human Contact hazard: II  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical: 99.87%  
 7.2 **Storage Temperature:** Currently not available  
 7.3 **Inert Atmosphere:** Currently not available  
 7.4 **Venting:** Currently not available  
 7.5 **IMO Pollution Category:** D  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** III  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** 5000 pounds  
 8.7 **EPA Pollution Category:** D  
 8.8 **RCRA Waste Number:** U057  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 98.15  
 9.3 **Boiling Point at 1 atm:** 312.4°F = 155.8°C = 429.0°K  
 9.4 **Freezing Point:** -24.2°F = -31.2°C = 242.0°K  
 9.5 **Critical Temperature:** 672.8°F = 356°C = 629.2°K  
 9.6 **Critical Pressure:** 560 psia = 38 atm = 3.8 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.945 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 34 dynes/cm = 0.034 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** 90 dynes/cm = 0.090 N/m at 22.7°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.084  
 9.12 **Latent Heat of Vaporization:** 160 Btu/lb = 91 cal/g = 3.8 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -15,430 Btu/lb = -8570 cal/g = -358.8 X 10<sup>3</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 0.8 psia

### NOTES



# CYCLOHEXANONE

CCH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	60.020	35	0.419	35	1.066	55	2.513
40	59.880	40	0.421	40	1.054	60	2.377
45	59.730	45	0.424	45	1.043	65	2.250
50	59.580	50	0.427	50	1.032	70	2.133
55	59.440	55	0.430	55	1.021	75	2.023
60	59.290	60	0.432	60	1.010	80	1.921
65	59.140	65	0.435	65	0.998	85	1.826
70	58.990	70	0.438	70	0.987	90	1.737
75	58.850	75	0.441	75	0.976	95	1.654
80	58.700	80	0.444	80	0.965	100	1.577
85	58.550	85	0.446	85	0.954	105	1.504
90	58.400	90	0.449	90	0.942	110	1.436
95	58.260	95	0.452	95	0.931	115	1.372
100	58.110	100	0.455			120	1.312
105	57.960					125	1.255
110	57.810					130	1.202
115	57.670					135	1.152
120	57.520					140	1.105
125	57.370					145	1.060
130	57.220					150	1.018
135	57.080					155	0.978
140	56.930					160	0.941
						165	0.905
						170	0.872
						175	0.840

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	5.000	60	0.327	60	0.00575	0	0.222
		70	0.407	70	0.00702	25	0.237
		80	0.503	80	0.00852	50	0.251
		90	0.616	90	0.01025	75	0.265
		100	0.750	100	0.01226	100	0.279
		110	0.907	110	0.01456	125	0.293
		120	1.090	120	0.01719	150	0.306
		130	1.301	130	0.02017	175	0.320
		140	1.543	140	0.02353	200	0.334
		150	1.821	150	0.02731	225	0.347
		160	2.137	160	0.03154	250	0.360
		170	2.496	170	0.03624	275	0.373
		180	2.900	180	0.04146	300	0.386
		190	3.355	190	0.04721	325	0.399
		200	3.863	200	0.05355	350	0.412
		210	4.430	210	0.06049	375	0.425
		220	5.060	220	0.06807	400	0.437
		230	5.757	230	0.07633	425	0.450
		240	6.526	240	0.08529	450	0.462
		250	7.372	250	0.09498	475	0.474
		260	8.299	260	0.10540	500	0.486
		270	9.313	270	0.11670	525	0.498
		280	10.420	280	0.12880	550	0.510
		290	11.620	290	0.14170	575	0.522
		300	12.920	300	0.15550	600	0.534

# CYANOGEN CHLORIDE

CCL

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid or gas

Colorless

Sharp, pungent odor

Poisonous vapor cloud is produced. Boiling point is 56°F.

Evacuate.  
Keep people away. Evacuate area in case of large discharges.  
AVOID CONTACT WITH LIQUID AND VAPOR.  
Wear chemical protective suit with self-contained breathing apparatus.  
Stay upwind and use water spray to "knock down" vapor.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
POISONOUS GASES ARE PRODUCED WHEN HEATED IN FIRE.  
Wear chemical protective suit with self-contained breathing apparatus.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.

VAPOR  
POISONOUS IF INHALED OR IF SKIN IS EXPOSED.  
Irritating to eyes.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

LIQUID  
POISONOUS IF SWALLOWED.  
Will burn skin and eyes.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
DO NOT INDUCE VOMITING.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: CNCl
- 2.3 IMO/UN Designation: 6.1/1589
- 2.4 DOT ID No.: 1589
- 2.5 CAS Registry No.: 506-77-4
- 2.6 NAERG Guide No.: 125
- 2.7 Standard Industrial Trade Classification: 52381

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical cartridge respirator, goggles, protective clothing.
- 3.2 **Symptoms Following Exposure:** Similar in toxicity and mode of action to hydrogen cyanide, but is much more irritating. Can cause a marked irritation of the respiratory tract with a hemorrhagic exudate of the bronchi and trachea and pulmonary edema. It is improbable that anyone would voluntarily remain in areas with a high enough concentration to exert a typical nitrile effect.
- 3.3 **Treatment of Exposure:** INHALATION: support respiration and administer oxygen; call a doctor; if nitrile effect is seen, administer amyl nitrite. INGESTION: have victim drink water or milk; do NOT induce vomiting.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 0.3 ppm.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Long term exposure causes dermatitis, loss of appetite, headache, upper respiratory irritation in humans.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and-third- degree burns on short contact; very injurious to the eyes.
- 3.12 **Odor Threshold:** 1 ppm
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Overheated containers can explode
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Very slow reaction
- 5.2 **Reactivity with Common Materials:**  
Slow, not immediately hazardous
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.08 ppm/fish/killed/fresh water  
\*Duration not specified
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison Gas
- 8.2 **49 CFR Class:** 2.3
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** P033
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 61.48
- 9.3 **Boiling Point at 1 atm:** 55.6°F = 13.1°C = 286.3°K
- 9.4 **Freezing Point:** 20°F = -6.9°C = 266.3°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.222 at 0°C (liquid)
- 9.8 **Liquid Surface Tension:** 24.6 dynes/cm = 0.0246 N/m at 10°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 2.1
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
1.229
- 9.12 **Latent Heat of Vaporization:** 191.3 Btu/lb = 106.3 cal/g = 4.451 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# CYANOGEN CHLORIDE

CCL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	76.089		C	32	1.040		C
40	75.780		U	34	1.040		U
45	75.469		R	36	1.040		R
50	75.160		R	38	1.040		R
55	74.849		E	40	1.040		E
			N	42	1.040		N
			T	44	1.040		T
			L	46	1.040		L
			Y	48	1.040		Y
			N	50	1.040		N
			O	52	1.040		O
			T	54	1.040		T
			A				A
			V				V
			A				A
			I				I
			L				L
			A				A
			B				B
			L				L
			E				E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	-100	0.028	-100	0.00044	0	0.167
	N	-90	0.051	-90	0.00080	25	0.169
	S	-80	0.091	-80	0.00137	50	0.172
	O	-70	0.155	-70	0.00228	75	0.174
	L	-60	0.257	-60	0.00368	100	0.176
	U	-50	0.411	-50	0.00575	125	0.178
	B	-40	0.641	-40	0.00874	150	0.180
	L	-30	0.973	-30	0.01297	175	0.182
	E	-20	1.443	-20	0.01880	200	0.184
		-10	2.095	-10	0.02669	225	0.186
		0	2.983	0	0.03717	250	0.187
		10	4.170	10	0.05086	275	0.189
		20	5.733	20	0.06845	300	0.190
		30	7.759	30	0.09075	325	0.192
		40	10.350	40	0.11860	350	0.193
		50	13.620	50	0.15310	375	0.194
						400	0.195
						425	0.196
						450	0.197
						475	0.198
						500	0.199
						525	0.199
						550	0.200
						575	0.200
						600	0.200

# CALCIUM CYANIDE

CCN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cyanide of calcium Cyanogas A-dust Cyanogas G-fumigant	Solid  White to gray or black  Almond odor  Sinks and mixes with water.
Evacuate. KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST. Wear goggles and self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED. DO NOT USE WATER, FOAM OR CARBON DIOXIDE ON ADJACENT FIRES.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. MAY BE DANGEROUS IF IT ENTERS WATER INTAKES. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Ca}(\text{CN})_2$  plus inert ingredients
- 2.3 IMO/UN Designation: 6.1/1575
- 2.4 DOT ID No.: 1575
- 2.5 CAS Registry No.: 592-01-8
- 2.6 NAERG Guide No.: 157
- 2.7 Standard Industrial Trade Classification: 52381

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus and full protective clothing, including rubber footwear.
- 3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, nausea, vomiting and weakness; high concentrations are rapidly fatal.
- 3.3 **Treatment of Exposure:** Call a doctor immediately. INHALATION: break amyl nitrite pearl in cloth and hold lightly under nose for 15 sec.; repeat 5 times at 15-sec. intervals; use artificial respiration if breathing stops. EYES: flush with water for 15 min.; do not allow water to enter nose or mouth. SKIN: flush with water; do not allow water to enter nose or mouth. INGESTION: break an amyl nitrite pearl in a cloth and hold lightly under nose for 15 sec.; if patient is conscious, induce vomiting and repeat until vomit is clear; repeat inhalation of amyl nitrite 5 times at 15-sec. intervals; use artificial respiration if breathing has stopped.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 5 mg/m<sup>3</sup> as cyanide.
- 3.7 **Toxicity by Ingestion:** Grade 4; oral LD<sub>50</sub> = 39 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 25 mg/m<sup>3</sup> as cyanide
- 3.14 **OSHA PEL-TWA:** 5 mg/m<sup>3</sup> as cyanide.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Use dry chemical, sand, or earth on adjacent fires.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water or carbon dioxide on adjacent fires.
- 4.5 **Special Hazards of Combustion Products:** Decomposes in fire to give very toxic gases, including hydrogen cyanide.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Releases very poisonous hydrogen cyanide gas slowly on contact with water. Release is rapid if acid is also present.
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable if kept dry
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 0.12 ppm/96 hr/sunfish/TL<sub>m</sub>/fresh water  
>25 ppm/48 hr/cookle/LC<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 42% with 58% inert ingredients. May contain up to 3% calcium carbide, which releases flammable acetylene gas when wet.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** well-sealed containers in ventilated area
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: I
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** P021
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 92
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.853 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -264 Btu/lb = -147 cal/g = -6.14 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CALCIUM CYANIDE

CCN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# COBALT NITRATE

CCO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cobalt(II) nitrate Cobaltous nitrate Cobaltous nitrate hexahydrate		Solid	Red	Odorless
		Sinks and mixes with water.		
<b>Keep people away.</b> Shut off ignition sources and call fire department. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Flood discharge area with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 10141-05-6
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52359

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Bu. Mines approved respirator; rubber gloves; safety goggles; protective clothing
- 3.2 **Symptoms Following Exposure:** Inhalation causes shortness of breath and coughing; permanent disability may occur. Ingestion causes pain and vomiting. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air; if breathing has stopped, begin artificial respiration and call a doctor. INGESTION: give large amount of water; induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: flush with water.
- 3.4 **TLV-TWA:** 0.02 mg/m<sup>3</sup> as cobalt
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> about 400 mg/kg (rabbit)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes malignant tumors in rabbits
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 20 mg/m<sup>3</sup> as cobalt
- 3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as cobalt
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.
- 4.6 **Behavior in Fire:** May increase the intensity of fire
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Contact with wood and paper may cause fire.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
10 ppm\*/stickleback/lethal conc. limit/fresh water  
15 ppm\*/68 hr/stickleback/avg. survival time/fresh water  
20 ppm\*/96 hr/stickleback/avg. survival time/fresh water  
\*as cobalt
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Bioconcentration of 200-1000 fold only under constant exposure. Not significant in spill conditions.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical hexahydrate. May also be shipped as anhydrous solid.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0 1
Flammability (Red).....	0 0
Instability (Yellow).....	0 0
Special (White).....	OX OX

\* First column refers to non-fire situations.

- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 291.04
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 131°F = 55°C = 328°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.54 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 31 Btu/lb = 17 cal/g = 0.71 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COBALT NITRATE

CCO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	84.730		N O T		N O T		N O T
36	85.469						
38	86.200						
40	86.929						
42	87.669		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	88.400						
46	89.129						
48	89.870						
50	90.599						
52	91.330						
54	92.070						
56	92.799						
58	93.530						
60	94.270						
62	95.000						
64	95.730						
66	96.469						
68	97.200						
70	97.929						
72	98.669						
74	99.400						
76	100.099						
78	100.900						
80	101.599						
82	102.299						
84	103.099						

# CALCIUM PEROXIDE

CCP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Calcium dioxide	Solid powder Yellow to white Odorless  Sinks in water.
Keep people away. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. Containers may explode in fire. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid. DUST Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CaO}_2$   
2.3 IMO/UN Designation: 5.1/1457  
2.4 DOT ID No.: 1457  
2.5 CAS Registry No.: 1305-79-9  
2.6 NAERG Guide No.: 140  
2.7 Standard Industrial Trade Classification: 52269

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** U.S.B.M.-approved toxic dust respirator; general-purpose gloves; chemical safety goggles; full cover clothing.  
3.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Dust also irritates eyes and skin on contact and irritates mouth and stomach if ingested.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air. EYES: flush with water for 15 min. and consult physician. SKIN: flush with water. INGESTION: give large amounts of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable, but may cause fire on contact with combustible material.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Flood with water, or use dry powder (e.g., graphite or powdered limestone)  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Can increase severity of fire. Containers may explode.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts very slowly with water at room temperature to form limewater and oxygen gas.  
5.2 **Reactivity with Common Materials:**  
Heavy metals and dirt can accelerate decomposition to lime and oxygen. The reaction is not explosive.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial: 60+%  
7.2 **Storage Temperature:** Stable  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer  
8.2 **49 CFR Class:** 5.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 72.1  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 2.92 at 25°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** -135 Btu/lb = -75 cal/g =  $-3.1 \times 10^5$  J/kg  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# CALCIUM PEROXIDE

CCP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CALCIUM CHROMATE

CCR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Calcium chromate (vi) Calcium chromate dihydrate Gelbin yellow ultramarine Steinbuhl yellow	Solid  Yellow  Odorless  Sinks and mixes slowly with water.
<b>Keep people away. Avoid contact with solid and dust.</b> <b>Wear rubber overclothing (including gloves).</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CaCrO}_4 \cdot 2\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 13765-19-0
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52499

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes severe circulatory collapse and chronic nephritis. Contact with eyes causes irritation. Contact with skin may cause dermatitis and ulcers.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air. INGESTION: give large amounts of water; induce vomiting. EYES: flush with water for at least 15 min. SKIN: treat local injuries like acid burns; scrub with dilute (2%) sodium hyposulfite solution.
- 3.4 **TLV-TWA:** 0.001 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50-500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Lung cancer may develop.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic chromium fume may be formed in fires.
- 4.6 **Behavior in Fire:** The hydrated salt loses water when hot and changes color, but no increase in hazard occurs.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Not flammable
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Bioconcentration up to 2000-fold possible under constant exposure. Not significant under spill conditions.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** U032
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 192.1
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** > 1 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -73 Btu/lb = -41 cal/g = -1.7 X 10<sup>4</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CALCIUM CHROMATE

CCR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	10.940		N		N		N
36	10.970		O		O		O
38	11.010		T		T		T
40	11.050						
42	11.080		P		P		P
44	11.120		E		E		E
46	11.160		R		R		R
48	11.190		T		T		T
50	11.230		I		I		I
52	11.270		N		N		N
54	11.300		E		E		E
56	11.340		N		N		N
58	11.380		E		E		E
60	11.410		N		N		N
62	11.450		T		T		T
64	11.490						
66	11.520						
68	11.560						
70	11.600						
72	11.630						
74	11.670						
76	11.710						
78	11.740						
80	11.780						
82	11.820						
84	11.850						

# CREOSOTE, COAL TAR

CCT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Creosote oil Dead oil	Liquid  Yellow to black  Tarry odor  May float or sink in water.
Call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Chemical and Physical Treatment:  
Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 21; Phenols, cresols  
2.2 Formula: Mixture  
2.3 IMO/UN Designation: 9/1993  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 8001-58-9  
2.6 NAERG Guide No.: Not listed.  
2.7 Standard Industrial Trade Classification: 33521

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** All-service canister mask; rubber gloves; chemical safety goggles and/or face shield; overalls or a neoprene apron; barrier creams.
- 3.2 **Symptoms Following Exposure:** Vapors cause moderate irritation of nose and throat. Liquid causes severe burns of eyes and reddening and itching of skin. Prolonged contact with skin can cause burns. Ingestion causes salivation, vomiting, respiratory difficulties, thready pulse, vertigo, headache, loss of pupillary reflexes, hypothermia, cyanosis, mild convulsions.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if he is not breathing, give artificial respiration, preferably mouth-to-mouth; if breathing is difficult, give oxygen; call a physician. EYES: flush immediately with plenty of water for at least 15 min. and call a physician. SKIN: wipe with vegetable oil or margarine, then wash with soap and water. INGESTION: have victim drink water or milk; do NOT induce vomiting.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Repeated exposures may cause cancer of skin.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** >160°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide or foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Heavy, irritating black smoke is formed.  
4.7 **Auto Ignition Temperature:** 637°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Whole creosote or various fractions, depending on boiling point. All have similar properties.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1 pound  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** U051  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Mixture  
9.3 **Boiling Point at 1 atm:** >356°F = >180°C = >353°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.05-1.09 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 15 dynes/cm = 0.015 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -12,500 Btu/lb = -6,900 cal/g = -290 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

### NOTES

# CREOSOTE, COAL TAR

CCT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
51	67.379	51	0.400		N	67	12.000
52	67.349	52	0.400		O		
53	67.309	53	0.400		T		
54	67.280	54	0.400				
55	67.240	55	0.400		P		
56	67.209	56	0.400		E		
57	67.169	57	0.400		R		
58	67.139	58	0.400		T		
59	67.099	59	0.400		I		
60	67.070	60	0.400		N		
61	67.030	61	0.400		E		
62	67.000	62	0.400		N		
63	66.969	63	0.400		T		
64	66.929	64	0.400				
65	66.900	65	0.400				
66	66.860	66	0.400				
67	66.830	67	0.400				
68	66.790	68	0.400				
69	66.759	69	0.400				
70	66.719	70	0.400				
71	66.690	71	0.400				
72	66.650	72	0.400				
73	66.620	73	0.400				
74	66.580	74	0.400				
75	66.549	75	0.400				
76	66.509	76	0.400				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# COPPER CYANIDE (OUS)

CCY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cupricin Cuprous cyanide		Solid powder      White  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.	
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b> DUST Irritating to eyes, nose and throat. If inhaled will cause dizziness or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>SOLID</b> POISONOUS IF SWALLOWED. Irritating to skin and eyes. If swallowed will cause dizziness and loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 <b>CG Compatibility Group:</b> Not listed. 2.2 <b>Formula:</b> CuCN 2.3 <b>IMO/UN Designation:</b> 6.1/1587 2.4 <b>DOT ID No.:</b> 1587 2.5 <b>CAS Registry No.:</b> 544-92-3 2.6 <b>NAERG Guide No.:</b> 151 2.7 <b>Standard Industrial Trade Classification:</b> 52381
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Dust respirator; protective goggles or face mask; protective clothing 3.2 <b>Symptoms Following Exposure:</b> Following severe exposure to dust, symptoms of cyanide poisoning may develop (see ingestion). Ingestion causes anxiety, confusion, dizziness, sudden loss of consciousness, odor of bitter almonds on breath or in vomitus, rapid weak pulse, convulsions, and paralysis. Contact with eyes causes irritation. 3.3 <b>Treatment of Exposure:</b> Get medical attention after all exposures to this substance. <b>INHALATION:</b> remove victim to fresh air. <b>INGESTION:</b> if breathing has stopped, begin artificial respiration immediately; administer by inhalation amyl nitrite pearls for 15-30 seconds of every minute, while a sodium nitrite solution is being prepared; discontinue amyl nitrite and immediately inject intravenously 10 ml of a 3% soln. of sodium nitrite (nonsterile if necessary) over a period of 2 to 4 min.; do not remove needle; through same needle infuse 50 ml of a 25% aqueous soln. of sodium thiosulfate; injection should take about 10 min. (Concentrations of 5-50% are permissible if total dose is approx. 12 grams.) Oxygen therapy may be of value in combination with the above. If symptoms recur, repeat injections of nitrite and thiosulfate at half the above doses. <b>EYES:</b> flush with water for at least 15 min. <b>SKIN:</b> flush with water; wash with soap and water. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> 5 mg/m <sup>3</sup> as cyanide 3.7 <b>Toxicity by Ingestion:</b> Grade 4; LD <sub>50</sub> < 50 mg/kg 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 25 mg/m <sup>3</sup> as cyanide 3.14 <b>OSHA PEL-TWA:</b> 5 mg/m <sup>3</sup> as cyanide 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic hydrogen cyanide gas may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable. In presence of moisture, toxic hydrogen cyanide gas may collect in enclosed spaces.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Copper known to be accumulated by shellfish. Hazard to humans unknown.
- 6.5 **GESAMP Hazard Profile:**  
**Bioaccumulation:** +  
**Damage to living resources:** 4  
**Human Oral hazard:** 3  
**Human Contact hazard:** I  
**Reduction of amenities:** XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; C.P.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Closed container
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** P029
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 89.56
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.92 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 30.1 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# COPPER CYANIDE (OUS)

CCY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

## CACODYLIC ACID

CDA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ansar Dimethylarsinic acid Hydroxydimethylarsine oxide Silvisar 510	Solid  Colorless or dyed blue  Odorless  Sinks and mixes with water.
<b>KEEP PEOPLE AWAY.</b> <b>AVOID CONTACT WITH SOLID AND DUST.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $(\text{CH}_3)_2\text{AsOOH}$   
2.3 IMO/UN Designation: 6.1/1572  
2.4 DOT ID No.: 1572  
2.5 CAS Registry No.: 75-60-5  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 51550

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust respirator; goggles; protective clothing.  
3.2 Symptoms Following Exposure: Chemical is essentially non-irritating in contact with skin or eyes. Ingestion causes arsenic poisoning, but symptoms are delayed.  
3.3 Treatment of Exposure: Be alert for delayed arsenic poisoning symptoms. EYES or SKIN: flush with water. INGESTION: induce vomiting and call physician at once.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2: oral rat  $\text{LD}_{50}$  = 700 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Arsenic poisoning  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: May form toxic oxides of arsenic when heated.  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not Pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not Pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 100 ppm/96 hr/scud/not toxic  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: 0  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial: 50% solution in water, dyed blue  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 1 pound  
8.7 EPA Pollution Category: X  
8.8 RCRA Waste Number: U136  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 138  
9.3 Boiling Point at 1 atm:  $>392^\circ\text{F} = >200^\circ\text{C} = >473^\circ\text{K}$   
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity:  $>1.1$  (est.) at  $20^\circ\text{C}$  (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.)  $-6,000 \text{ Btu/lb} = -3,300 \text{ cal/g} = -140 \times 10^3 \text{ J/kg}$   
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: (est.)  $-54 \text{ Btu/lb} = -30 \text{ cal/g} = -1.3 \times 10^5 \text{ J/kg}$   
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES



# CACODYLIC ACID

CDA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	60.500		N		N		N
36	61.000		O		O		O
38	61.500		T		T		T
40	62.000						
42	62.500		P		P		P
44	63.000		E		E		E
46	63.500		R		R		R
48	64.000		T		T		T
50	64.500		I		I		I
52	65.000		N		N		N
54	65.500		E		E		E
56	66.000		N		N		N
58	66.500		E		E		E
60	67.000		N		N		N
62	67.500		T		T		T
64	68.000						
66	68.500						
68	69.000						
70	69.500						
72	70.000						
74	70.500						
76	71.000						
78	71.500						
80	72.000						
82	72.500						
84	73.000						

# CADMIUM CHLORIDE

CDC

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid crystals      White      Odorless

Sinks and mixes with water.

Protect water intakes.  
Notify local health and pollution control agencies.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.

SOLID  
Harmful if swallowed.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Chemical and Physical Treatment:  
Absorb

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CdCl}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2570  
2.5 CAS Registry No.: 10108-64-2  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 52329

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses, rubber gloves, and respirator with proper filter.  
3.2 **Symptoms Following Exposure:** Ingestion causes gastroenteric distress, pain, and prostration. Sensory disturbances, liver injury, and convulsions have been observed in severe intoxications.  
3.3 **Treatment of Exposure:** INGESTION: induce vomiting and follow with gastric lavage, a saline cathartic, and demulcents. Consider using atropine, opiates, and fluid therapy.  $\text{CaNa}_2\text{EDTA}$  has been effective in acutely poisoned animals and in a few humans. BAL has been found sufficiently effective in animal experiments to justify its use in human intoxication. Since the BAL-cadmium complex has a nephrotoxic action, the physician will have to decide whether or not to use this drug.  
3.4 **TLV-TWA:** 0.01 mg  $\text{Cd}/\text{m}^3$  inhalable; 0.002 mg  $\text{Cd}/\text{m}^3$  respirable fraction.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4;  $\text{LD}_{50}$  below 50 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause second degree burns on long exposure.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 9 mg/ $\text{m}^3$  as Cd  
3.14 **OSHA PEL-TWA:** 0.005 mg/ $\text{m}^3$  as Cd.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.94 ppm/96 hr/bluegill/ $\text{TL}_{50}$ /fresh water  
6.2 **Waterfowl Toxicity:**  $\text{LC}_{50}$  >5000 ppm.  
6.3 **Biological Oxygen Demand (BOD):** Not pertinent  
6.4 **Food Chain Concentration Potential:**  
Not pertinent  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 228.35  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 4.05 at 25°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 28.8 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# CADMIUM CHLORIDE

CDC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	98.759		N		N		N
36	101.099		O		O		O
38	103.299		T		T		T
40	105.599						
42	107.900		P		P		P
44	110.200		E		E		E
46	112.500		R		R		R
48	114.799		T		T		T
50	117.099		I		I		I
52	119.400		N		N		N
54	121.700		E		E		E
56	123.900		N		N		N
58	126.200		E		E		E
60	128.500		N		N		N
62	130.799		T		T		T
64	133.099						
66	135.400						
68	137.699						
70	140.000						
72	142.299						
74	144.500						
76	146.799						
78	149.099						
80	151.400						
82	153.699						
84	156.000						

# CHLORDANE

CDN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlordan 1,2,4,5,6,7,8,8-Octachloro- 2,3,3a,4,7,7a-hexahydro-4,7- methanoindene Octa-klor Toxichlor Velsicol 1068	Liquid  Brown  Sharp odor  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable but solution may be combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLUTION POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Do not burn	<b>2. CHEMICAL DESIGNATIONS</b>  2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>10</sub> H <sub>6</sub> Cl <sub>8</sub> 2.3 IMO/UN Designation: 6.1/2762 2.4 DOT ID No.: 2902 2.5 CAS Registry No.: 57-74-9 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 59110
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Respirator for sprays, fogs, or dust; goggles; rubber gloves. 3.2 <b>Symptoms Following Exposure:</b> Moderately irritating to eyes and skin. Ingestion, absorption through skin, or inhalation of mist or dust may cause excitability, convulsions, nausea, vomiting, diarrhea, and some local irritation of the gastrointestinal tract. 3.3 <b>Treatment of Exposure:</b> INHALATION: administer oxygen and give fluid therapy; do not give epinephrine, since it may induce ventricular fibrillation; enforce complete rest. EYES: flush with water for at least 15 min. SKIN: wash off skin with adequate quantities of soap and water; do NOT scrub. INGESTION: induce vomiting and follow with gastric lavage and administration of saline cathartics; ether and barbiturates may be used to control convulsions; oxygen and fluid therapy are also recommended; do NOT give epinephrine. Since no specific antidotes are known, symptomatic therapy must be accompanied by complete rest. 3.4 <b>TLV-TWA:</b> 0.5 mg/m <sup>3</sup> (skin) 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; oral LD <sub>50</sub> = 283 mg/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Possible liver damage; loss of appetite and weight. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 100 mg/m <sup>3</sup> 3.14 <b>OSHA PEL-TWA:</b> 0.5 mg/m <sup>3</sup> 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Solution: 225°F O.C.; 132°F C.C. Solid is not flammable.
- 4.2 **Flammable Limits in Air:** 0.7%-5% (kerosene solution)
- 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective on solution fire.
- 4.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride and phosgene gases may be formed when kerosene solution of compound burns.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 410°F (kerosene solvent)
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable to 160°F
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.5 ppm/96 hr/goldfish/TL<sub>m</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** LD<sub>50</sub> = 1,200 mg/kg
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** High
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical. A variety of dusts, powders, and solutions in kerosene containing 2-80% chlordane are shipped.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** U036
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 409.8
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.6 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -4,000 Btu/lb = -2,200 cal/g = -93 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available \*Properties refer to undiluted, technical-grade chlordane.

## NOTES

# CHLORDANE

CDN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	100.400	60	0.300	60	1.209	130	58.980
54	100.400	61	0.300	61	1.209	140	51.140
56	100.299	62	0.300	62	1.209	150	44.560
58	100.200	63	0.300	63	1.209	160	38.990
60	100.200	64	0.300	64	1.209	170	34.270
62	100.099	65	0.300	65	1.209	180	30.240
64	100.000	66	0.300	66	1.209	190	26.780
66	99.940	67	0.300	67	1.209	200	23.810
68	99.879	68	0.300	68	1.209	210	21.240
70	99.809	69	0.300	69	1.209	220	19.020
72	99.740	70	0.300	70	1.209	230	17.080
74	99.669	71	0.300	71	1.209	240	15.390
76	99.599	72	0.300	72	1.209	250	13.900
78	99.530	73	0.300	73	1.209	260	12.590
80	99.459	74	0.300	74	1.209	270	11.440
82	99.389	75	0.300	75	1.209	280	10.420
84	99.320	76	0.300	76	1.209	290	9.516
86	99.250	77	0.300	77	1.209	300	8.710

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	215	0.000	215	0.00001		N
	N	220	0.000	220	0.00001		O
	S	225	0.000	225	0.00002		T
	O	230	0.000	230	0.00002		
	L	235	0.001	235	0.00003		P
	U	240	0.001	240	0.00005		E
	B	245	0.001	245	0.00007		R
	I	250	0.002	250	0.00009		T
	E	255	0.002	255	0.00012		I
		260	0.003	260	0.00017		N
		265	0.004	265	0.00023		E
		270	0.006	270	0.00031		N
		275	0.008	275	0.00042		T
		280	0.011	280	0.00056		
		285	0.015	285	0.00074		
		290	0.019	290	0.00099		
		295	0.026	295	0.00131		
		300	0.035	300	0.00174		
		305	0.046	305	0.00228		
		310	0.060	310	0.00300		
		315	0.079	315	0.00391		
		320	0.104	320	0.00510		
		325	0.136	325	0.00662		
		330	0.177	330	0.00856		
		335	0.230	335	0.01104		
		340	0.297	340	0.01418		

# CARBON DIOXIDE

CDO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carbonic acid gas Carbonic anhydride	Liquefied compressed gas or solid  Colorless gas or white solid  Odorless  Solid sinks and boils in water. Visible vapor cloud is produced.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND SOLID.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).	
<b>Fire</b>	Not flammable. Containers may explode in fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR If inhaled will cause dizziness, or difficult breathing. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID OR SOLID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: CO<sub>2</sub>
- 2.3 IMO/UN Designation: 2/1013
- 2.4 DOT ID No.: 1013
- 2.5 CAS Registry No.: 124-38-9
- 2.6 NAERG Guide No.: 120
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus in excessively high CO<sub>2</sub> concentration areas. For handling liquid or solid, wear safety goggles or face shield, insulated gloves, long-sleeved shirt, and trousers worn outside boots or over high-top shoes to shed spilled liquid.
- 3.2 **Symptoms Following Exposure:** Inhalation causes increased respiration rate, headache, subtle physiological changes for up to 5% concentration and prolonged exposure. Higher concentrations can cause unconsciousness and death. Solid can cause cold contact burns. Liquid or cold gas can cause freezing injury to skin or eyes similar to a burn.
- 3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air. SKIN: treat burns from contact with solid in same way as frostbite.
- 3.4 TLV-TWA: 5000 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: 30,000 ppm
- 3.7 **Toxicity by Ingestion:** Not pertinent (gas with low boiling point)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 Chronic Toxicity: None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 IDLH Value: 40,000 ppm
- 3.14 OSHA PEL-TWA: 5,000 ppm
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode when heated.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
100-200 mg/l/°various organisms/LC<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Inhalation 5-8%, no effect
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research: 99.995+%; Instrument: 99.99+%; Bone Dry: 99.95+%; Commercial: 99.5+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Liquid-safety relief; solid-open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Nonflammable gas
- 8.2 **49 CFR Class:** 2.2
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 44.0
- 9.3 **Boiling Point at 1 atm:** Not pertinent (sublimes)
- 9.4 **Freezing Point:** -109.3°F = -78.5°C = 194.7°K
- 9.5 **Critical Temperature:** 87.8°F = 31°C = 304.2°K
- 9.6 **Critical Pressure:** 1.070 psia = 72.9 atm = 7.40 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.56 at -79°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 1.53
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0474
- 9.12 **Latent Heat of Vaporization:** 150 Btu/lb = 83 cal/g = 3.5 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 43.2 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CARBON DIOXIDE

CDO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N o  D a t a		N O  T  P E R T I N E N T	10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95	0.837 0.814 0.791 0.768 0.745 0.722 0.699 0.676 0.653 0.630 0.607 0.584 0.561 0.538 0.515 0.492 0.469 0.446		N O  T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84	0.339 0.330 0.321 0.312 0.303 0.294 0.285 0.276 0.267 0.258 0.249 0.240 0.231 0.222 0.213 0.204 0.195 0.186 0.177 0.168 0.159 0.150 0.141 0.132 0.123 0.114	-35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75	161.500 178.000 195.799 215.000 235.500 257.399 280.899 305.899 332.500 360.799 390.799 422.599 456.199 491.799 529.299 568.899 610.599 654.299 700.299 748.500 799.099 852.000 907.299	-35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75	1.55800 1.69800 1.84700 2.00400 2.17100 2.34700 2.53200 2.72800 2.93300 3.14900 3.37500 3.61100 3.85900 4.11700 4.38600 4.66700 4.95900 5.26200 5.57700 5.90400 6.24300 6.59300 6.95600	40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200	0.197 0.198 0.199 0.199 0.200 0.200 0.201 0.202 0.202 0.203 0.203 0.204 0.204 0.205 0.206 0.206 0.207

# CUPRIETHYLENEDIAMINE SOLUTION

CES

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cupriethylenediamine hydroxide solution	Liquid	Blue to dark purple	Fishy odor
Sinks and mixes with water. Irritating vapor is produced.			
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID.</b> Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. Irritating gases may be produced when heated.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Cu}(\text{OH})_2 \cdot \text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2 \cdot \text{H}_2\text{O}$
- 2.3 IMO/UN Designation: 8/1761
- 2.4 DOT ID No.: 1761
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 51489

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; organic canister mask; rubber gloves; protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation of vapor irritates mucous membrane and may cause asthma. Liquid causes severe irritation of eyes and possible corneal injury. Contact with skin causes irritation. Ingestion causes irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; support respiration; call physician. EYES: irrigate with copious quantities of water for at least 15 min.; call physician. SKIN: wash with large amounts of water. INGESTION: give large amounts of water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Non-flammable solution
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Irritating vapors of ethylenediamine may be produced when heated.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Dissolves cotton, wood, and other cellulosic materials. Corrosive to copper, aluminum, zinc, and tin.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: (3)  
Human Oral hazard: (2)  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Nitrogen
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	4
Instability (Yellow).....	2
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Mixture
- 9.3 **Boiling Point at 1 atm:** (approx.) 212°F = 100°C = 373°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** (est.) > 1.1 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# CUPRIETHYLENEDIAMINE SOLUTION

CES

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	68.660		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CADMIUM FLUOROBORATE

CFB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cadmium fluoborate Cadmium fluoborate solution	Liquid  Colorless  Odorless  Sinks and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles and self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Cd}(\text{BF}_4)_2 \cdot \text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2570
- 2.5 CAS Registry No.: 14486-19-2
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves and apron; safety glasses and face shield
- 3.2 **Symptoms Following Exposure:** Ingestion produces severe toxic symptoms; both kidney and liver injuries may occur; may be fatal. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove patient to fresh air; seek medical attention.  
INGESTION: call a physician at once; if victim is conscious, induce vomiting by giving a tablespoon of salt in a glass of warm water and repeat until vomit is clear; give milk or whites of eggs beaten with water; keep patient warm and quiet. EYES: flush with plenty of water and get medical attention. SKIN: flush with plenty of water.
- 3.4 **TLV-TWA:** 0.01 mg Cd/m<sup>3</sup> inhalable; 0.002 mg Cd/m<sup>3</sup> respirable fraction.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 250 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Delayed liver, kidney, and lung damage has followed respiratory exposure to cadmium salts in industry.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 9 mg/m<sup>3</sup> as Cd
- 3.14 **OSHA PEL-TWA:** 0.005 mg/m<sup>3</sup> as Cd
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic hydrogen fluoride and cadmium oxide fumes may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Concentrated by shellfish
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 50% solution in water
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 286 (solute)
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.60 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

**CFB**

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
51	99.879		N		N		N
52	99.879		O		O		O
53	99.879		T		T		T
54	99.879						
55	99.879		P		P		P
56	99.879		E		E		E
57	99.879		R		R		R
58	99.879		T		T		T
59	99.879		I		I		I
60	99.879		N		N		N
61	99.879		E		E		E
62	99.879		N		N		N
63	99.879		T		T		T
64	99.879						
65	99.879						
66	99.879						
67	99.879						
68	99.879						
69	99.879						
70	99.879						
71	99.879						
72	99.879						
73	99.879						
74	99.879						
75	99.879						
76	99.879						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# COBALT FORMATE

CFM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cobalt diformate Cobaltous formate	Solid  Red
Sinks and mixes with water.	
Keep people away. AVOID CONTACT WITH SOLID AND DUST. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to skin and eyes. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration.  SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{Co}(\text{HCOO})_2 \cdot 2\text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 544-18-3  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 51374

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** NIOSH approved respirator if needed, rubberized fabric gloves, chemical dust goggles.  
3.2 **Symptoms Following Exposure:** EYES: Causes burns. SKIN: Can cause ulceration.  
3.3 **Treatment of Exposure:** Call a physician. EYES: Flush with copious amounts of water. SKIN: Wash thoroughly.  
3.4 **TLV-TWA:** 0.02 mg/m<sup>3</sup> as cobalt  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May cause dermatitis and hypersensitivity of skin.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 20 mg/m<sup>3</sup> as Cobalt  
3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as cobalt  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Decomposes at 175°C.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
10 ppm lethal concentration for sticklebacks (as Co).  
Fish food organisms affected by concentration of 0.5 ppm Co.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Microorganisms can concentrate cobalt in water up to 1070 to 1500 times.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 148.98 anhydrous; 185.00 dihydrate  
9.3 **Boiling Point at 1 atm:** Becomes anhydrous at 140°C. Decomposes at 175°C.  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 2.13 at 22°C dihydrate  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COBALT FORMATE

CFM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	5.030		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# CRESYL GLYCIDYL ETHER

CGE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cresol, epoxypropyl ether Tolyl epoxypropyl ether Tolyl glycidyl ether	Liquid White  Sinks and mixes with water.
Keep people away. Shut off ignition sources. Call fire department. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump  
Chemical and Physical Treatment:  
Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{C}_6\text{H}_4\text{-O-CH}_2\text{-CH-CH}_2\text{-O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 1319-77-3  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51615

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Organic canister mask or air pack; rubber gloves; goggles or face shield; body covering clothing.  
3.2 **Symptoms Following Exposure:** Contact with eyes causes irritation. Contact with skin causes primary irritation and allergic sensitization.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. EYES: flush with water for at least 15 min.; get medical attention. SKIN: immediately wash off with soap and water.  
3.4 **TLV-TWA:** 5 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Poisonous.  
3.8 **Toxicity by Inhalation:** Poisonous.  
3.9 **Chronic Toxicity:** Extensive skin contact may be fatal in very short time.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 250 ppm  
3.14 **OSHA PEL-TWA:** 5 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 187°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Wear full body and respiratory protection.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May attack some forms of plastics.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical, 100%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 164  
9.3 **Boiling Point at 1 atm:** (approx.) 498°F = 259°C = 532°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.09 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.72  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** (est.) -16,500 Btu/lb = -9,190 cal/g = -384 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CRESYL GLYCIDYL ETHER

CGE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	68.940	51	0.500	51	1.048		N O T  P E R T I N E N T
44	68.870	52	0.500	52	1.048		
46	68.799	53	0.500	53	1.048		
48	68.730	54	0.500	54	1.048		
50	68.660	55	0.500	55	1.048		
52	68.589	56	0.500	56	1.048		
54	68.530	57	0.500	57	1.048		
56	68.459	58	0.500	58	1.048		
58	68.389	59	0.500	59	1.048		
60	68.320	60	0.500	60	1.048		
62	68.250	61	0.500	61	1.048		
64	68.179	62	0.500	62	1.048		
66	68.110	63	0.500	63	1.048		
68	68.040	64	0.500	64	1.048		
70	67.969	65	0.500	65	1.048		
72	67.900	66	0.500	66	1.048		
74	67.830	67	0.500	67	1.048		
76	67.759	68	0.500	68	1.048		
		69	0.500	69	1.048		
		70	0.500	70	1.048		
		71	0.500	71	1.048		
		72	0.500	72	1.048		
		73	0.500	73	1.048		
		74	0.500	74	1.048		
		75	0.500	75	1.048		
		76	0.500	76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CYCLOHEXYLAMINE

CHA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aminocyclohexane Hexahydroaniline	Liquid  Colorless  Strong, fishy odor  Floats and mixes with water.
Keep people away. Avoid contact with liquid. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amine  
2.2 Formula:  $(\text{CH}_2)_6\text{CHNH}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2357  
2.5 CAS Registry No.: 108-91-8  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51453

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, chemical goggles, approved Bureau of Mines respirator for organic vapors.  
3.2 **Symptoms Following Exposure:** Cyclohexylamine is strongly caustic. Inhalation of vapors and contact of liquid with skin and eyes causes severe burns.  
3.3 **Treatment of Exposure:** INGESTION: do NOT induce vomiting. EYES: flush with water for at least 15 min. and obtain immediate medical attention. SKIN: immediately remove contaminated clothing and flush skin with large amounts of water.  
3.4 **TLV-TWA:** 10 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Produced cancer of the bladder in the rat.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentration.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact; very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 90°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic fumes of  $\text{NO}_x$  may be produced in fire.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 560°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 5.0 mm/min  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 48.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 99.18  
9.3 **Boiling Point at 1 atm:** 274.1°F = 134.5°C = 407.7°K  
9.4 **Freezing Point:** 0.1°F = -17.7°C = 255.5°K  
9.5 **Critical Temperature:** 647.6°F = 342°C = 615.2°K  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.865 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.42  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 158 Btu/lb = 87.6 cal/g =  $3.67 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** (est.) -18,000 Btu/lb = -10,000 cal/g =  $-420 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -4 Btu/lb = -2 cal/g =  $-0.1 \times 10^5$  J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# CYCLOHEXYLAMINE

CHA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	54.860	85	0.483	77	0.880		N O T  P E R T I N E N T
50	54.550	90	0.491				
60	54.230	95	0.499				
70	53.910	100	0.507				
80	53.590	105	0.515				
90	53.270	110	0.523				
100	52.950	115	0.531				
110	52.630	120	0.539				
120	52.310	125	0.547				
130	51.990	130	0.555				
140	51.670	135	0.563				
150	51.350	140	0.571				
160	51.040	145	0.579				
170	50.720	150	0.587				
180	50.400						
190	50.080						
200	49.760						
210	49.440						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	70	0.177	70	0.00309		N O T  P E R T I N E N T
		80	0.238	80	0.00407		
		90	0.316	90	0.00531		
		100	0.415	100	0.00685		
		110	0.541	110	0.00877		
		120	0.697	120	0.01112		
		130	0.892	130	0.01398		
		140	1.132	140	0.01744		
		150	1.424	150	0.02159		
		160	1.780	160	0.02653		
		170	2.208	170	0.03240		
		180	2.721	180	0.03930		
		190	3.331	190	0.04737		
		200	4.053	200	0.05677		
		210	4.903	210	0.06765		
		220	5.899	220	0.08019		
		230	7.058	230	0.09456		
		240	8.403	240	0.11100		
		250	9.954	250	0.12960		
		260	11.740	260	0.15070		
		270	13.780	270	0.17440		
		280	16.100	280	0.20110		

# CHARCOAL

CHC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Activated charcoal Animal carbon Mineral carbon Shell charcoal Vegetable carbon Wood charcoal	Solid powder, lumps, Black or grains Odorless  May float or sink in water.
<b>Keep people away.</b> <b>Shut off ignition sources. Call fire department.</b> <b>Stay upwind. Use water spray to "knock down" dust.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flood discharge area with water.
<b>Exposure</b>	DUST Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water.  SOLID Not harmful.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C  
2.3 IMO/UN Designation: 4.2/1361,1362  
2.4 DOT ID No.: 1361,1362  
2.5 CAS Registry No.: 7440-44-0  
2.6 NAERG Guide No.: 133  
2.7 Standard Industrial Trade Classification: 24500

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Respirator for dust  
3.2 Symptoms Following Exposure: No significant symptoms  
3.3 Treatment of Exposure: No treatment required  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Non-toxic (actually used in therapy of poisoning cases)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Flammable solid; may ignite spontaneously in air.  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Water.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Incomplete combustion forms toxic carbon monoxide.  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 600-750°F  
4.8 Electrical Hazards: Class I, Group F  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 4.8 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 1.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: May ignite spontaneously in air.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: None  
6.2 Waterfowl Toxicity: None  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Various grades; those containing appreciable volatile material are more likely to catch fire. All shipments must be exposed to air and so certified.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Spontaneously Combustible  
8.2 49 CFR Class: 4.2  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 12  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 2 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: 14,100 Btu/lb = 7,830 cal/g = 328 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# CHARCOAL

CHC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CHLOROHYDRINS

CHD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Crude epichlorohydrin	Watery liquid  Sinks and mixes with water. Poisonous vapor is produced.	Colorless to yellow  Poisonous vapor is produced.	Garlic odor
<b>Fire</b>  Keep people away. Avoid contact with liquid and vapor. Wear goggles and self-contained breathing apparatus. Call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Exposure</b>	<b>LIQUID</b> Poisonous if swallowed. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 17;  
Epichlorohydrin  
2.2 Formula:  $\text{O CH}_2\text{CHCH}_2\text{Cl}$   
2.3 IMO/UN Designation: 6.1/2023  
2.4 DOT ID No.: 2023  
2.5 CAS Registry No.: 106-89-8  
2.6 NAERG Guide No.: 131P  
2.7 Standard Industrial Trade Classification:  
51615

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister mask or air pack; protective goggles; protective gloves.  
3.2 **Symptoms Following Exposure:** May cause central nervous system depression. Vapor is irritating to eyes, nose and throat. Headache, nausea, vomiting, collapse if swallowed. Liquid irritates skin.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air, keep warm and quiet. Get medical attention at once. If breathing stops, start artificial respiration. INGESTION: Induce vomiting and call physician. Do NOT induce vomiting if unconscious. No specific antidote known. EYES AND SKIN: Flush with water for at least 15 min. and get medical attention. Remove contaminated clothing and wash before reuse.  
3.4 **TLV-TWA:** 0.5 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 50-500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 10 ppm  
3.13 **IDLH Value:** 75 ppm  
3.14 **OSHA PEL-TWA:** 5 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 92°F O.C. 100°F C.C.  
4.2 **Flammable Limits in Air:** 3.8%-21%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide, water spray  
4.4 **Fire Extinguishing Agents Not to Be Used:** Avoid use of dry chemical if fire occurs in container with confined vent.  
4.5 **Special Hazards of Combustion Products:** Toxic irritating vapors are generated when heated.  
4.6 **Behavior in Fire:** Containers may explode in fire because of polymerization.  
4.7 **Auto Ignition Temperature:** 804°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 2.6 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 16.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Mild reaction; not likely to be hazardous  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Can polymerize in presence of strong acids and bases, particularly when hot  
5.6 **Inhibitor of Polymerization:** None

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 90% epichlorohydrin, the balance being water (2.5%), 1, 2, 3-trichloropropane (5%), glycerol (1.8%), isopropyl chloride (0.5%), n-propyl chloride (0.8%) and others (1.0%).  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** (D)  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	2

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.18 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** (est.) 142 Btu/lb = 78.8 cal/g =  $3.30 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** (approx.) -8,100 Btu/lb = -4500 cal/g =  $-190 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.3 psia

### NOTES

# CHLOROHYDRINS

CHD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
32	73.660	85	0.336		N		N
34	73.660	90	0.341		O		O
36	73.660	95	0.346		T		T
38	73.660	100	0.350				
40	73.660	105	0.355		P		P
42	73.660	110	0.359		E		E
44	73.660	115	0.364		R		R
46	73.660	120	0.368		T		T
48	73.660	125	0.373		I		I
50	73.660	130	0.378		N		N
52	73.660	135	0.382		E		E
54	73.660	140	0.387		N		N
56	73.660	145	0.391		T		T
58	73.660	150	0.396				
60	73.660						
62	73.660						
64	73.660						
66	73.660						
68	73.660						
70	73.660						
72	73.660						
74	73.660						
76	73.660						
78	73.660						
80	73.660						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	6.000	35	0.029		C		C
		40	0.036		U		U
		45	0.044		R		R
		50	0.054		R		R
		55	0.065		E		E
		60	0.079		N		N
		65	0.095		T		T
		70	0.114		L		L
		75	0.137		Y		Y
		80	0.163				
		85	0.194		N		N
		90	0.230		O		O
		95	0.273		T		T
		100	0.321				
		105	0.378		A		A
		110	0.443		V		V
		115	0.518		A		A
		120	0.604		I		I
		125	0.702		L		L
		130	0.814		A		A
		135	0.942		B		B
		140	1.087		L		L
		145	1.252		E		E
		150	1.438				
		155	1.648				
		160	1.885				

# CHLOROACETIC ACID (80% OR LESS)

CHM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chloroacetic acid Chloroethanoic acid Monochloroacetic acid	Liquid Colorless to light yellow Strong vinegar-like odor
Keep people away. Avoid contact with liquid and vapor. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	May be combustible, depending upon concentration. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish fire with alcohol foam, dry chemical, carbon dioxide, or water. Flood discharge area with water.
<b>Exposure</b>	Call for medical aid.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 4; Organic acids
- 2.2 Formula: ClCH2COOH
- 2.3 IMO/UN Designation: 8/1750
- 2.4 DOT ID No.: 1750
- 2.5 CAS Registry No.: 79-11-8
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; vinyl or neoprene rubber gloves; goggles and protective face shield; rubberized or acid-resistant clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes mucous membrane irritation. Contact with liquid causes severe irritation and burns of the eyes and irritation and burns of skin. Ingestion causes burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention for all exposures to this compound. INHALATION: Remove victim to fresh air. EYES: Flush with running water for 15 min. SKIN: Flush with water. INGESTION: Give large amount of water to dilute the acid.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 76.2 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** 0.15 mg/m<sup>3</sup>
- 3.13 **IDLH Value:** Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 259°F C.C.
- 4.2 **Flammable Limits in Air:** 8% (LFL)
- 4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide, or water.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** None.
- 4.5 **Special Hazards of Combustion Products:** Toxic gases, such as hydrogen chloride, phosgene and carbon monoxide, may be generated.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 7.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 4.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Causes mild corrosion of common metals.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades of varying concentrations.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Pressure vacuum valve.
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: 100 pounds
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 94.5
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.328
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 3.26
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CHLOROACETIC ACID (80% OR LESS)

CHM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# CYCLOHEXANOL

CHN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Adronal Anol Cyclohexyl alcohol Hexahydrophenol Hexalin Hydroxycyclohexane	Oily liquid      Colorless to light yellow      Alcohol odor  Floats and mixes slowly with water. May solidify. Freezing point is 75°F
Keep people away. Avoid contact with liquid. Shut off ignition sources and call fire department. Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Contain  
 Collection Systems: Skim  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 20; Acohols, glycols  
 2.2 Formula: (CH<sub>2</sub>)<sub>5</sub>CHOH  
 2.3 IMO/UN Designation: Not listed  
 2.4 DOT ID No.: Not listed  
 2.5 CAS Registry No.: 108-93-0  
 2.6 NAERG Guide No.: Not listed  
 2.7 Standard Industrial Trade Classification: 51231

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield  
 3.2 **Symptoms Following Exposure:** Narcosis-depression of the central nervous system tending to produce sleep or unconsciousness.  
 3.3 **Treatment of Exposure:** Eye contact is more hazardous than inhalation, skin irritation, or ingestion. Flush eyes with water and remove victim to fresh air.  
 3.4 **TLV-TWA:** 50 ppm  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** 400 ppm  
 3.14 **OSHA PEL-TWA:** 50 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 160°F O.C. 154°F C.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide, or dry chemical.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 572°F  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** 3.9 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** 0.08 lb/lb, 5 days  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 2  
 Human Oral hazard: 1  
 Human Contact hazard: II  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical; pure  
 7.2 **Storage Temperature:** Currently not available  
 7.3 **Inert Atmosphere:** Currently not available  
 7.4 **Venting:** Currently not available  
 7.5 **IMO Pollution Category:** D  
 7.6 **Ship Type:** Data not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
 9.2 **Molecular Weight:** 100.16  
 9.3 **Boiling Point at 1 atm:** 322°F = 161°C = 434°K  
 9.4 **Freezing Point:** 74.5°F = 23.6°C = 296.8°K  
 9.5 **Critical Temperature:** 665.6°F = 352°C = 625.2°K  
 9.6 **Critical Pressure:** 540 psia = 37 atm = 3.7 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.947 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 34.2 dynes/cm = 0.0342 N/m at 16.2°C  
 9.9 **Liquid Water Interfacial Tension:** 3.9 dynes/cm = 0.0039 N/m at 25°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.071  
 9.12 **Latent Heat of Vaporization:** 196 Btu/lb = 109 cal/g = 4.56 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -16,000 Btu/lb = -8910 cal/g = -373 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** 4.19 cal/g  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 0.1 psia

### NOTES



# CYCLOHEXANOL

CHN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
75	58.980	82	0.502	75	0.933	76	58.430
80	58.850	84	0.502	80	0.930	78	54.480
85	58.720	86	0.502	85	0.927	80	50.820
90	58.580	88	0.502	90	0.924	82	47.430
95	58.451	90	0.502	95	0.921	84	44.290
100	58.320	92	0.502	100	0.918	86	41.380
105	58.190	94	0.502	105	0.915	88	38.680
110	58.060	96	0.502	110	0.912	90	36.180
115	57.930	98	0.502	115	0.909	92	33.850
120	57.790	100	0.502	120	0.906	94	31.690
125	57.660	102	0.502	125	0.903	96	29.680
130	57.530	104	0.502	130	0.900	98	27.810
135	57.401	106	0.502	135	0.897	100	26.070
140	57.270	108	0.502	140	0.894	102	24.450
145	57.130	110	0.502	145	0.891	104	22.940
150	57.000	112	0.502	150	0.889	106	21.540
155	56.870	114	0.502	155	0.886	108	20.230
160	56.740	116	0.502	160	0.883	110	19.000
165	56.610	118	0.502	165	0.880	112	17.860
170	56.480	120	0.502	170	0.877	114	16.800
175	56.341	122	0.502	175	0.874	116	15.800
180	56.210	124	0.502	180	0.871	118	14.870
185	56.080	126	0.502	185	0.868	120	14.000
190	55.950	128	0.502	190	0.865	122	13.190
		130	0.502	195	0.862		
		132	0.502	200	0.859		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
59	4.300	130	0.177	130	0.00280	0	0.255
		140	0.241	140	0.00376	25	0.271
		150	0.325	150	0.00498	50	0.286
		160	0.433	160	0.00653	75	0.302
		170	0.571	170	0.00847	100	0.317
		180	0.746	180	0.01088	125	0.332
		190	0.964	190	0.01385	150	0.346
		200	1.236	200	0.01748	175	0.361
		210	1.571	210	0.02189	200	0.375
		220	1.980	220	0.02719	225	0.390
		230	2.478	230	0.03352	250	0.404
		240	3.077	240	0.04104	275	0.418
		250	3.795	250	0.04990	300	0.432
		260	4.650	260	0.06029	325	0.445
		270	5.662	270	0.07241	350	0.459
		280	6.853	280	0.08645	375	0.472
						400	0.486
						425	0.499
						450	0.512
						475	0.524
						500	0.537
						525	0.549
						550	0.562
						575	0.574
						600	0.586

# CHLOROACETALDEHYDE

CHO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetaldehyde, chloro- Chloroacetaldehyde, monomer Chloroethanal 2-Chloro-1-ethanal Monochloroacetaldehyde	Liquid  Colorless  Very sharp, irritating  Sinks and mixes with water. Irritating vapor produced.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Evacuate. Shut off ignition sources. Call fire department. Wear positive pressure breathing apparatus and chemical protective suit. Stay upwind and use water spray to knock down vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE. POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED TO DECOMPOSITION. Containers may explode in fire. Vapor may explode if ignited in an enclosed area. Combat fire from safe distance or protected location. Extinguish small fire with water spray, fog or foam; large fires with water spray, fog or foam. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED OR ABSORBED THROUGH THE SKIN. Irritating to eyes, nose, throat, lungs, and skin. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR ABSORBED THROUGH SKIN. Contact may cause burns to skin and eyes. IF IN EYES OR ON SKIN, immediately flush with running water for at least 15 minutes; lift eyelids occasionally if appropriate. Speed in removing material from skin is of extreme importance. IF SWALLOWED and victim is CONSCIOUS, get victim to induce vomiting by touching back of throat or taking syrup of Ipecac. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Dilute and disperse Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $\text{ClCH}_2\text{CHO}$ 2.3 IMO/UN Designation: 6.1/2232 2.4 DOT ID No.: 2232 2.5 CAS Registry No.: 107-20-0 2.6 NAERG Guide No.: 153 2.7 Standard Industrial Trade Classification: 51621
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Wear positive pressure breathing apparatus and special chemical protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Poisonous; may be fatal if inhaled, swallowed or absorbed through the skin. Overexposure causes intense irritation and edema of the eyes, mucous membranes, respiratory tract, and skin. Prolonged exposure causes tissue destruction, chemical burns and residual scarring. The eyes may experience permanent damage. 3.3 <b>Treatment of Exposure:</b> INHALATION: Move victim to fresh air; call emergency medical care. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Immediately flush with running water for at least 15 minutes; lift upper and lower eyelids occasionally. SKIN: Immediately flush with running water for at least 15 minutes. Speed in removing material from skin is important. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; Keep victim under observation. INGESTION: If CONSCIOUS, get patient to induce vomiting by touching a finger to the back of the throat or by taking syrup of Ipecac. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: 1 ppm 3.7 Toxicity by Ingestion: Grade 4; $\text{LD}_{50}$ = 23 mg/kg (rat) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Showed mutagenic properties in the Ames test and in chinese hamsters and rats. 3.10 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes. 3.12 Odor Threshold: <1 ppm 3.13 IDLH Value: 45 ppm 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: 1 ppm 3.17 EPA AEG1: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 190°F C.C. (40% aqueous solution)  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Small fires: Dry chemical, carbon dioxide, water spray or foam. Large fires: Water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Contain poisonous and irritating chloride gases.  
4.6 **Behavior in Fire:** May yield highly toxic chloride fumes when heated to decomposition.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 9.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 4.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with water to form a hydrate; some heat is liberated. Reaction occurs when the concentration in water exceeds 50%.  
5.2 **Reactivity with Common Materials:** Contact with acids and oxidizing materials may cause fires or explosions.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent (40% aqueous solution)  
5.6 **Inhibitor of Polymerization:** Not pertinent (40% aqueous solution)

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 3  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 40% Aqueous solution  
7.2 **Storage Temperature:** Not listed  
7.3 **Inert Atmosphere:** Not listed  
7.4 **Venting:** Not listed  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	-

  
8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: P023  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 78.5  
9.3 Boiling Point at 1 atm: 185°F = 85°C = 358.2°K  
9.4 Freezing Point: 3°F = -16.3°C = 256.9°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.19 at 25°C  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 2.7  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# CHLOROACETALDEHYDE

CHO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	74.300		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	113	1.934		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CYCLOHEXANONE PEROXIDE

CHP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cadox HDP Dicyclohexanone diperoxide 1-Hydroperoxycyclohexyl 1-Hydroxycyclohexyl peroxide Luperco JDB-50-T	Thick liquid  Sinks in water.	White	Odorless
Keep people away. Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Containers may explode in fire. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.		
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim; Pump;  
 Dredge  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula:  $C_{12}H_{20}(OOH)OO C_{12}H_{20}OH$   
 2.3 IMO/UN Designation: 1/0071 (> 70%); 5.2/1525 (< 70)  
 2.4 DOT ID No.: Not listed  
 2.5 CAS Registry No.: 78-18-2  
 2.6 NAERG Guide No.: 147  
 2.7 Standard Industrial Trade Classification: 51628

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves; protective clothing.  
 3.2 **Symptoms Following Exposure:** Irritates eyes and skin on contact. Ingestion causes irritation of mouth and stomach.  
 3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min.; get medical attention. SKIN: wipe off and wash with soap and water; get medical attention if irritation occurs. INGESTION: induce vomiting; get medical attention.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5$  to  $5$  g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Odorless  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** Combustible solution 315°F C.C. (dibutyl phthalate)  
 4.2 **Flammable Limits in Air:** Not pertinent  
 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** May explode  
 4.7 **Auto Ignition Temperature:** 757°F (dibutyl phthalate)  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 71.4 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 23.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 45% paste with dibutyl phthalate.  
 7.2 **Storage Temperature:** Cool ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid or liquid  
 9.2 **Molecular Weight:** Mixture  
 9.3 **Boiling Point at 1 atm:** Decomposes  
 9.4 **Freezing Point:** Not pertinent  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 1.05 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** (est.) 35 dynes/cm = 0.035 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** (est.) -14,000 Btu/lb = -7,900 cal/g = -330 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Currently not available  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CYCLOHEXANONE PEROXIDE

CHP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CHROMIC SULFATE

CHS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chromium sulfate Chromium III sulfate Dichromium sulfate Dichromium trisulfate Sulfuric acid, chromium (3#I+) salt (3-2)	Solid  Peach, Violet, Dark green  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and solution. Wear goggles, self-contained breathing apparatus, and rubber gloves. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:**  $\text{Cr}_2(\text{SO}_4)_3 \cdot \text{Cr}_2(\text{SO}_4)_3 \cdot 10\text{H}_2\text{O}$  (technical)  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 10101-53-8  
2.6 **NAERG Guide No.:** 171  
2.7 **Standard Industrial Trade Classification:** 52349

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, safety glasses, laboratory coat, dust mask.  
3.2 **Symptoms Following Exposure:** INHALATION: Corrosive action on mucous membranes. SKIN: May elicit an allergic reaction. Corrosive action on skin. Lesions confined to exposed parts.  
3.3 **Treatment of Exposure:** Call a physician. EYES: Wash with plenty of water. SKIN: Wash exposed parts well with water.  
3.4 **TLV-TWA:** 0.5 mg/m<sup>3</sup> as Cr.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** A potential carcinogen for man.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 25 mg/m<sup>3</sup> as Cr(III)  
3.14 **OSHA PEL-TWA:** 1 mg/m<sup>3</sup> as Cr  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Any media suitable for the supporting fire.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Decomposes to chromic acid when heated.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Add water slowly, stir in slight excess of soda ash. Let stand 24 hours. Neutralize with 6M HCl. Flush with large excess of water.  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Lethal concentration to stickelbacks 1.2 mg/l.  
Fish critical concentration 1 mg/l.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Cr<sup>3+</sup> lowers 5-day BOD 50% at concentrations from 62.5 to 117 mg/l.  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Store in cool, dry place.  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not listed  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 392.20  
9.3 **Boiling Point at 1 atm:** Loses water of hydration at 100°C Cr<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> · 18 loses 12 Cr<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> · 15 loses 10  
9.4 **Freezing Point:** 212°F = 100°C = 373.1°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 3.012 at room temperature for anhydrous salt Hydrated: 1.867 at 17°C for 15 H<sub>2</sub>O; 1.7 at 22°C for 18 H<sub>2</sub>O  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CHROMIC SULFATE

CHS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	120.000		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# CYCLOHEXENYLTRICHLOROSILANE

CHT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sentry	Liquid  Colorless  Sharp, irritating odor  Reacts with water. Poisonous gas is produced on contact with water.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE.
<b>Exposure</b>	CALL FOR MEDICAL AID. GAS PRODUCED IN REACTION WITH WATER. POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_6H_9SiCl_3$   
2.3 IMO/UN Designation: 8/1762  
2.4 DOT ID No.: 1762  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 156  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Acid-vapor type air respirator; rubber gloves; chemical worker's goggles; other protective equipment as necessary to protect skin and eyes.  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membrane. Contact with eyes or skin causes severe burns. Ingestion causes severe burns of mouth and stomach.  
3.3 **Treatment of Exposure:** Get medical attention immediately following all exposures to this compound.  
INHALATION: remove from exposure; support respiration. EYES: flush with water for 15 min.  
SKIN: flush with water. INGESTION: give large amounts of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $LD_{50} = 2,830$  mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
> 150°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam  
4.5 **Special Hazards of Combustion Products:** Irritating, toxic hydrogen chloride and phosgene may be generated in a fire.  
4.6 **Behavior in Fire:** Difficult to extinguish. Re-ignition may occur. Water applied to adjacent fires will produce hydrogen chloride upon contact with this material.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** Reacts to generate hydrogen chloride (hydrochloric acid).  
5.2 **Reactivity with Common Materials:**  
Corrodes metals by reacting with surface moisture and generating hydrogen chloride.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 215.6  
9.3 **Boiling Point at 1 atm:** > 300°F = > 149°C = > 422°K  
9.4 **Freezing Point:** (est.) < 77°F = < 25°C = < 248°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.23 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -78 Btu/lb = -43 cal/g = -1.8 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# CYCLOHEXENYLTRICHLOROSILANE

CHT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	77.059	60	0.350	60	0.728	60	3.575
61	77.020	61	0.350	62	0.728	61	3.525
62	76.990	62	0.350	64	0.728	62	3.476
63	76.950	63	0.350	66	0.728	63	3.428
64	76.919	64	0.350	68	0.728	64	3.381
65	76.879	65	0.350	70	0.728	65	3.335
66	76.849	66	0.350	72	0.728	66	3.290
67	76.809	67	0.350	74	0.728	67	3.245
68	76.780	68	0.350	76	0.728	68	3.201
69	76.740	69	0.350	78	0.728	69	3.158
70	76.709	70	0.350	80	0.728	70	3.116
71	76.679	71	0.350	82	0.728	71	3.074
72	76.639	72	0.350	84	0.728	72	3.033
73	76.610	73	0.350	86	0.728	73	2.993
74	76.570	74	0.350	88	0.728	74	2.954
75	76.540	75	0.350			75	2.915
76	76.500	76	0.350			76	2.877
77	76.469	77	0.350			77	2.839
78	76.429						
79	76.400						
80	76.360						
81	76.330						
82	76.290						
83	76.259						
84	76.219						
85	76.190						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CYCLOHEXANE

CHX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hexahydrobenzene Hexamethylene Hexanaphthene	Watery liquid      Colorless      Gasoline-like odor  Floats on water. Flammable irritating vapor is produced. Freezing point is 44°F.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with foam, dry chemicals or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, nausea, vomiting or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 31; Paraffin  
2.2 **Formula:** C<sub>6</sub>H<sub>12</sub>  
2.3 **IMO/UN Designation:** 3.1/1145  
2.4 **DOT ID No.:** 1145  
2.5 **CAS Registry No.:** 110-82-7  
2.6 **NAERG Guide No.:** 128  
2.7 **Standard Industrial Trade Classification:** 51121

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Hydrocarbon vapor canister, supplied-air or hose mask, hydrocarbon-insoluble rubber or plastic gloves, chemical goggles or face splash shield, hydrocarbon-insoluble rubber or plastic apron.
- 3.2 **Symptoms Following Exposure:** Dizziness, with nausea and vomiting. Concentrated vapor may cause unconsciousness and collapse.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if breathing stops, apply artificial respiration and administer oxygen. SKIN OR EYE CONTACT: remove contaminated clothing and gently flush affected areas with water for 15 min.; call a physician.
- 3.4 **TLV-TWA:** 300 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 1,300 ppm
- 3.14 **OSHA PEL-TWA:** 300 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -4°F C.C.
- 4.2 **Flammable Limits in Air:** 1.33%-8.35%
- 4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective on fire.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 518°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 6.9 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 15,500 ppm/24 hr/mosquito fish/TL<sub>m</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research grades: 99.5%, 98.0%; commercial: 85-98%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester) or pressure-vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** U056
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 84.16
- 9.3 **Boiling Point at 1 atm:** 177.3°F = 80.7°C = 353.9°K
- 9.4 **Freezing Point:** 43.8°F = 6.6°C = 279.8°K
- 9.5 **Critical Temperature:** 536.5°F = 280.3°C = 553.5°K
- 9.6 **Critical Pressure:** 591 psia = 40.2 atm = 4.07 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.779 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 24.6 dynes/cm = 0.0246 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** 50 dynes/cm = 0.050 N/m at 25°C
- 9.10 **Vapor (Gas) Specific Gravity:** 2.9
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.087
- 9.12 **Latent Heat of Vaporization:** 150 Btu/lb = 85 cal/g = 3.6 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -18,684 Btu/lb = -10,380 cal/g = -434.59 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 7.47 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 3.3 psia

### NOTES

# CYCLOHEXANE

CHX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
55	49.030	45	0.421	65	0.838	52	1.125
60	48.870	50	0.424	70	0.833	54	1.101
65	48.710	55	0.427	75	0.829	56	1.078
70	48.550	60	0.429	80	0.824	58	1.055
75	48.390	65	0.432	85	0.819	60	1.033
80	48.230	70	0.435	90	0.814	62	1.012
85	48.060	75	0.438	95	0.810	64	0.991
90	47.900	80	0.441	100	0.805	66	0.971
95	47.730	85	0.443	105	0.800	68	0.952
100	47.570	90	0.446	110	0.795	70	0.933
105	47.400	95	0.449	115	0.791	72	0.914
110	47.230	100	0.452	120	0.786	74	0.896
115	47.060	105	0.454	125	0.781	76	0.879
120	46.890	110	0.457	130	0.776	78	0.862
125	46.720	115	0.460	135	0.772	80	0.845
130	46.550	120	0.463	140	0.767	82	0.829
135	46.370	125	0.466	145	0.762	84	0.813
140	46.200	130	0.468	150	0.757	86	0.798
145	46.020	135	0.471	155	0.752	88	0.783
150	45.850	140	0.474	160	0.748	90	0.768
155	45.670	145	0.477	165	0.743	92	0.754
160	45.490	150	0.479	170	0.738	94	0.740
165	45.320	155	0.482			96	0.727
170	45.140	160	0.485			98	0.714
175	44.960	165	0.488			100	0.701
		170	0.491			102	0.689

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
83	0.015	45	0.792	45	0.01230	0	0.247
		50	0.909	50	0.01399	25	0.265
		55	1.041	55	0.01587	50	0.283
		60	1.190	60	0.01795	75	0.300
		65	1.356	65	0.02026	100	0.317
		70	1.542	70	0.02282	125	0.335
		75	1.748	75	0.02564	150	0.352
		80	1.978	80	0.02874	175	0.369
		85	2.233	85	0.03214	200	0.385
		90	2.515	90	0.03588	225	0.402
		95	2.827	95	0.03996	250	0.419
		100	3.171	100	0.04442	275	0.435
		105	3.550	105	0.04928	300	0.451
		110	3.965	110	0.05457	325	0.467
		115	4.421	115	0.06032	350	0.483
		120	4.921	120	0.06655	375	0.499
		125	5.466	125	0.07330	400	0.515
		130	6.061	130	0.08059	425	0.531
		135	6.710	135	0.08846	450	0.546
		140	7.415	140	0.09694	475	0.561
		145	8.181	145	0.10610	500	0.576
		150	9.011	150	0.11590	525	0.592
		155	9.910	155	0.12640	550	0.606
		160	10.880	160	0.13770	575	0.621
		165	11.930	165	0.14970	600	0.636
		170	13.060	170	0.16260		

# CALCIUM HYPOCHLORITE

CHY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> HTH HTH dry chlorine Neutral anhydrous calcium hypochlorite	Solid granules      White  Household bleaching powder odor  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Wear goggles and self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear chemical protective suit including self-contained breathing apparatus. Extinguish adjacent fires with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Ca}(\text{OCI})_2$
- 2.3 IMO/UN Designation: 5.1/1748
- 2.4 DOT ID No.: 1748
- 2.5 CAS Registry No.: 7778-54-3
- 2.6 NAERG Guide No.: 140
- 2.7 Standard Industrial Trade Classification: 52331

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective goggles, dust mask.
- 3.2 **Symptoms Following Exposure:** INHALATION: hypochlorous acid fumes given off only if compound comes in contact with acid, cause severe respiratory tract irritation and pulmonary edema. INGESTION: pain and inflammation of mouth, pharynx, esophagus, and stomach; erosion of mucous membranes, chiefly of the stomach; vomiting (hemorrhaging may cause vomitus to resemble coffee grounds); circulatory collapse, with cold and clammy skin, cyanosis, and shallow respirations; confusion, delirium, coma; edema of pharynx, glottis, and larynx, with stridor and obstruction; perforation of esophagus or stomach, with mediastinitis or peritonitis. SKIN CONTACT: may cause vesicular eruptions and eczematoid dermatitis.
- 3.3 **Treatment of Exposure:** INGESTION: swallow immediately milk, egg white, starch paste, milk of magnesia, aluminum hydroxide gel, or magnesium trisilicate gel. Avoid sodium bicarbonate because of the release of carbon dioxide. Do not use acidic antidotes; cautious gastric lavage with tap water or a 1% solution of sodium thiosulfate; milk of magnesia (1 oz) left in the stomach is useful as a mild antacid, adsorbent, demulcent, and cathartic; demulcents, such as starch, egg white, milk, gruel; opiates for the control of pain. Treat shock vigorously with intravenous fluids. Prompt surgical intervention when indicated, e.g., tracheotomy, gastrectomy. SKIN: wash with liberal quantities of water and apply a paste of baking soda.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> above 15 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Irritates eyes, skin, and mucous membranes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Poisonous gases may be produced when heated
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** May cause fire in contact with wood or straw. Corrosive to most metals.
- 5.3 **Stability During Transport:** The 70% grade may decompose violently if exposed to heat or direct sunlight. Gives off chlorine and chlorine monoxide above 350°F (poisonous gases).
- 5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 0.5 ppm\*/trout/killed/fresh water  
\*Time period not specified
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Not pertinent
- 6.4 **Food Chain Concentration Potential:** Not pertinent
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 70% (self-propagating); 65% (non propagating)
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** B/C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer
- 8.2 49 CFR Class: 5.1
- 8.3 49 CFR Package Group: II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification	
Health Hazard (Blue).....	1	2
Flammability (Red).....	0	0
Instability (Yellow).....	2	2
Special (White).....	OX	
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Oxidizer
- 9.2 **Molecular Weight:** 174.98
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.35 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CALCIUM HYPOCHLORITE

CHY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# COPPER IODIDE

CID

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cuprous iodide Marshite	Solid  Tan or off-white  Odorless  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Irritating gases may be produced when heated.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:** CuI
- 2.3 **IMO/UN Designation:** Not listed
- 2.4 **DOT ID No.:** Not listed
- 2.5 **CAS Registry No.:** Currently not available
- 2.6 **NAERG Guide No.:** Not listed
- 2.7 **Standard Industrial Trade Classification:** 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion of copper salts produces violent vomiting and purging, intense pain, collapse, coma, convulsions, and paralysis. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water; induce vomiting; get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water.
- 3.4 **TLV-TWA:** Notice of intended change: 0.05 mg Cu/m<sup>3</sup> respirable particles
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50-500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 100 mg/m<sup>3</sup> as copper (dusts, mists, fumes)
- 3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as copper
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Irritating hydrogen iodide or iodine vapors may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Copper known to be accumulated by shellfish. Hazard to humans unknown.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Anhydrous, 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 190.4
- 9.3 **Boiling Point at 1 atm:** 2,354°F = 1,290°C = 1,563°K
- 9.4 **Freezing Point:** 1,121°F = 605°C = 878°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 5.62 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 13.6 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COPPER IODIDE

CID

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

# CITRIC ACID

CIT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Hydroxy-1,2,3-propane-tricarboxylic acid beta-Hydroxytricarballic acid beta-Hydroxy-tricarboxylic acid	Solid  White  Odorless   Sinks and mixes in water.
<b>Keep people away.</b> <b>Avoid contact with solid and dust.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, water, foam or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{HOC}(\text{CH}_2\text{CO}_2\text{H})_2\text{CO}_2\text{H}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 77-92-9
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51391

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; protective gloves
- 3.2 Symptoms Following Exposure: Inhalation of dust irritates nose and throat. Contact with eyes causes irritation.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air. EYES: flush immediately with physiological saline or water; get medical care if irritation persists. SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 1; oral  $\text{LD}_{50} = 11.7 \text{ g/kg (rat)}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Chronic effects in humans are unknown
- 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent (combustible solid)
- 4.2 Flammable Limits in Air: 0.28-2.29  $\text{kg/m}^3$  (dust)
- 4.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Currently not available
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Melts and decomposes. The reaction is not hazardous.
- 4.7 Auto Ignition Temperature: 1,850°F (powder)
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 21.4 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 10.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Will corrode copper, zinc, aluminum and their alloys.
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 894 ppm/4 hr/goldfish/killed/fresh water  
160 ppm/48 hr/shore crab/TL<sub>50</sub>/salt water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): 40%, 5 days; 60%, 10-20 days
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 1/BOD  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: USP; Reagent; Monohydrate grade
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 192.1
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: 307°F = 153°C = 426°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.54 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: -4,000 Btu/lb = -2,220 cal/g = -93.0 J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES



# CITRIC ACID

CIT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	98.370		N		N		N
36	101.099		O		O		O
38	103.900		T		T		T
40	106.700						
42	109.500		P		P		P
44	112.299		E		E		E
46	115.000		R		R		R
48	117.799		T		T		T
50	120.599		I		I		I
52	123.400		N		N		N
54	126.099		E		E		E
56	128.900		N		N		N
58	131.699		E		E		E
60	134.500		N		N		N
62	137.299		T		T		T
64	140.000						
66	142.799						
68	145.599						
70	148.400						
72	151.099						
74	153.900						
76	156.699						
78	159.500						
80	162.299						
82	165.000						
84	167.799						

# 2-CHLOROPROPIONIC ACID

CLA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> alpha-Chloropropionic acid Propanoic acid, 2-chloro- Propionic acid, 2-chloro-	Liquid	Pale yellow	Slight
Sinks and mixes with water.			
Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR. Shut off ignition sources. Call fire department. Wear self-contained positive pressure breathing apparatus and full protective clothing. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Poisonous gases may be produced in fire. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Move container from fire area if you can do it without risk. Cool containers exposed to flames with plenty of water from the side until well after fire is out.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Harmful if inhaled May cause lung and eye injury. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if absorbed through skin. Harmful if swallowed. Remove contaminated clothing and shoes at the site. Flush with running water for at least 15 min.; hold eyelids open if necessary. IF IN EYES OR ON SKIN, wash skin with soap and water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 4; Organic acid  
2.2 Formula: CH<sub>3</sub>CHClCOOH  
2.3 IMO/UN Designation: 8/2511  
2.4 DOT ID No.: 2511  
2.5 CAS Registry No.: 598-78-7  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Harmful if inhaled. Irritating to throat. May cause severe skin and eye burns. Harmful if absorbed through skin.
- 3.3 **Treatment of Exposure:** INHALATION: Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If conscious have victim drink eggs, milk or water. DO NOT INDUCE VOMITING. If unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 **TLV-TWA:** 0.1 ppm (skin)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 500 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposures; may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 225°F. C.C.
- 4.2 **Flammable Limits in Air:** 3.6% (LFL) (calculated)
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam. Water or foam may cause frothing.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** May contain hydrogen chloride and phosgene.
- 4.6 **Behavior in Fire:** Fires produces highly toxic chloride fumes.
- 4.7 **Auto Ignition Temperature:** 932°F.
- 4.8 **Electrical Hazards:** Not applicable
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 14.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Only aluminum, stainless steel or steel covered with a protective lining or coating may contact the liquid or vapor.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** (C)
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | -              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 108.53
- 9.3 **Boiling Point at 1 atm:** 366°F. = 186°C. = 459.2°K.
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** 750°F = 399°C = 672°K (est.)
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.2585 at 20°C.
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 3.7
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** 175 Btu/lb = 97 cal/g = 4.06X10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2-CHLOROPROPIONIC ACID

CLA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	125 150 175 200 225 250 275 300 325 350	0.029 0.082 0.196 0.417 0.812 1.475 2.531 4.143 6.519 9.181	125 150 175 200 225 250 275 300 325 350	0.00064 0.00171 0.00389 0.00794 0.01488 0.02611 0.04341 0.06906 0.10585 0.15719		C U R R E N T L Y  N O T  A V A I L A B L E

# CALCIUM CHLORIDE

CLC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Calcium chloride, anhydrous Calcium chloride hydrates	Solid or water solution  White to off-white  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with liquid and solid. Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. SOLUTION OR SOLID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CaCl}_2 \cdot x\text{H}_2\text{O}$  where  $x = 0$  to  $6$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 10043-52-4
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52322

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses or face shield, dust-type respirator, rubber gloves
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes (particularly by dust) causes irritation and possible transient corneal injury. Contact of solid with dry skin causes mild irritation; strong solutions can cause marked irritation, even a superficial burn.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air; if discomfort persists, get medical attention. INGESTION: give large amounts of water. EYES: promptly flood with water and continue washing for at least 15 min.; consult an ophthalmologist. SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; oral  $\text{LD}_{50} = 1,000 \text{ mg/kg}$  (rat)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not Pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not Pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Anhydrous grade dissolves with evolution of some heat.
- 5.2 Reactivity with Common Materials: Metals will slowly corrode in aqueous solutions.
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 555 ppm/168 hr/rock bass/killed/tap water  
10,650 ppm/96 hr/sunfish/ $\text{LD}_{50}$ /fresh water  
2,400 ppm/48 hr/marine fish/ $\text{TLM}$ /sea water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Anhydrous 90-97%; water solutions containing 51-86%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 110.99 (solute)
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.15 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution:  $-292 \text{ Btu/lb} = -162 \text{ cal/g} = -6.79 \times 10^5 \text{ J/kg}$
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: 55 cal/g
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# CALCIUM CHLORIDE

CLC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	60.330		N		N		N
36	61.170		O		O		O
38	62.000		T		T		T
40	62.830						
42	63.670		P		P		P
44	64.500		E		E		E
46	65.330		R		R		R
48	66.169		T		T		T
50	67.000		I		I		I
52	67.830		N		N		N
54	68.669		E		E		E
56	69.500		N		N		N
58	70.330		E		E		E
60	71.169		N		N		N
62	72.000		T		T		T
64	72.830						
66	73.669						
68	74.500						
70	75.330						
72	76.169						
74	77.000						
76	77.830						
78	78.669						
80	79.500						
82	80.330						
84	81.169						

# COLLODION

CLD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Box toe gum Cellulose nitrate solution Nitrocellulose gum Nitrocellulose solution Pyroxylin solution	Thick liquid      Colorless      Ether-like odor  Floats on water. Flammable, irritating vapor is produced. Boiling point is around 94°F.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE: POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, difficult breathing, or loss of consciousness. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Not harmful.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula: Not pertinent  
 2.3 IMO/UN Designation: 3.2/2059  
 2.4 DOT ID No.: 2059  
 2.5 CAS Registry No.: Currently not available  
 2.6 NAERG Guide No.: 127  
 2.7 Standard Industrial Trade Classification: 51489

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; rubber gloves; goggles or face shield.
- 3.2 **Symptoms Following Exposure:** High concentration of ether fumes may cause narcosis, loss of consciousness and respiratory paralysis if inhaled. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; initiate artificial respiration if breathing has stopped; call physician.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> > 15 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
-49°F C.C. (ether)
- 4.2 **Flammable Limits in Air:** 1.9%-36% (ether solution)
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** The formation of extremely toxic gases, notably oxides of nitrogen, hydrogen cyanide, and carbon monoxide is possible.
- 4.6 **Behavior in Fire:** Highly flammable solvent vapors are formed. May travel a long distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 356°F (ether)
- 4.8 **Electrical Hazards:** Class I, Group C
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: -  
 Human Oral hazard: 1  
 Human Contact hazard: 0  
 Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** USP. All grades contain less than 60% nitrocellulose by weight.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category             | Classification | 0 | 1 | 2 |
|----------------------|----------------|---|---|---|
| Health Hazard (Blue) | .....          | 0 | 2 |   |
| Flammability (Red)   | .....          | 3 | 3 |   |
| Instability (Yellow) | .....          | 3 | 3 |   |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** 93°F = 34°C = 307°K (ether solvent)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.772 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COLLODION

CLD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
76	48.060		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 3-CHLOROPROPIONIC ACID

CLP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 3-Chloropropanoic acid beta-Chloropropionic acid beta-Monochloropropionic acid Propionic acid, 3-chloro-	Solid, crystals      Colorless      Sharp  Sinks and mixes with water.
<b>Keep people away. AVOID CONTACT WITH SOLID.</b> <b>Shut off ignition sources and call fire department.</b> <b>Wear self-contained positive pressure breathing apparatus and full protective clothing.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Poisonous gases may be produced in fire. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Move container from fire area if you can do it without risk. Cool containers exposed to flames with water from the side until well after the fire is out.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. Harmful if swallowed. IF IN EYES OR ON SKIN, flush with running water for at least 15 min.; hold eyelids open if necessary. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 4; Organic acid  
2.2 Formula: CICH<sub>2</sub>CH<sub>2</sub>COOH  
2.3 IMO/UN Designation: 8/2511  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 107-94-8  
2.6 NAERG Guide No.: Not listed.  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Contact may cause skin and eye burns. Harmful if swallowed.
- 3.3 **Treatment of Exposure:** EYES OR SKIN: Immediately flush with running water for at least 15 min.; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site.  
INGESTION: If victim is unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = > 2.0 g/kg (Mouse)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Tumorigenic toward the lungs of mice. Possible mutagen.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause second-degree burns on long exposures.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
>230°F. C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Contain toxic chloride fumes.
- 4.6 **Behavior in Fire:** May produce toxic and irritating fumes.
- 4.7 **Auto Ignition Temperature:** Not applicable
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 14.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Only aluminum, stainless steel or steel covered with a protective lining or coating may contact the liquid or vapor.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** (C)
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 108.53
- 9.3 **Boiling Point at 1 atm:** 392°F = 200°C = 473.2°K
- 9.4 **Freezing Point:** 106°F = 41°C = 314°K
- 9.5 **Critical Temperature:** 787°F = 420°C = 693°K (est.)
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.26
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Not pertinent

### NOTES



# 3-CHLOROPROPIONIC ACID

CLP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# CAPROLACTAM

CLS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aminocaproic lactam epsilon-Caprolactam Hexahydro-2H-azepine-2-one 2-Ketohexamethylenimine 2-Oxohexamethylenimine	Liquid or solid in solution Colorless Mild odor  Sinks and mixes with water.
<p>Keep people away.  Call fire department.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 22; Caprolactam solution  
2.2 **Formula:** HNCH<sub>2</sub>(CH<sub>2</sub>)<sub>5</sub>CO  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 105-60-2  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51577

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Gas mask or self-contained breathing apparatus; rubber gloves and boots; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Inhalation causes coughing or mild irritation. Contact with hot liquid will burn eyes and skin.  
3.3 **Treatment of Exposure:** INHALATION: remove patient to fresh air. EYES: wash with copious quantities of water for at least 15 min.; call physician. SKIN: wash with water; call physician in case of thermal burn.  
3.4 **TLV-TWA:** 1 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** 3 mg/m<sup>3</sup>  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 2,140 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** 0.3 mg/m<sup>3</sup>  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 257°F O.C. 230°F C.C.  
4.2 **Flammable Limits in Air:** 1.84% (LEL)  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 2.4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 44.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** 75°C  
7.3 **Inert Atmosphere:** Nitrogen cushion  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 113  
9.3 **Boiling Point at 1 atm:** 515°F = 268°C = 541°K  
9.4 **Freezing Point:** 154°F = 68°C = 341°K  
9.5 **Critical Temperature:** 944.4°F = 506.9°C = 780.1°K  
9.6 **Critical Pressure:** 660 psia = 45 atm = 4.6 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.02 at 77°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 77°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 77°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.9  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 209 Btu/lb = 116 cal/g = 4.85 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -13,700 Btu/lb = -7,640 cal/g = -320 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** -324 Btu/lb = -180 cal/g = -7.5 X 10<sup>5</sup> J/kg  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.45 psia

### NOTES

# CAPROLACTAM

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
159	64.070	160	0.508	159	1.169	160	10.940
160	64.040	162	0.509	160	1.169	162	10.590
161	64.000	164	0.510	161	1.169	164	10.250
162	63.970	166	0.511	162	1.169	166	9.927
163	63.930	168	0.513	163	1.169	168	9.613
164	63.900	170	0.514	164	1.169	170	9.312
165	63.860	172	0.515	165	1.169	172	9.021
166	63.830	174	0.516	166	1.169	174	8.742
167	63.800	176	0.517	167	1.169	176	8.472
168	63.760	178	0.518	168	1.169	178	8.213
169	63.730	180	0.519	169	1.169	180	7.963
170	63.690	182	0.520	170	1.169	182	7.723
171	63.660	184	0.521	171	1.169	184	7.491
172	63.620	186	0.523	172	1.169	186	7.267
173	63.590	188	0.524	173	1.169	188	7.051
174	63.550	190	0.525	174	1.169	190	6.843
175	63.520	192	0.526	175	1.169	192	6.642
176	63.480	194	0.527	176	1.169	194	6.449

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	525.000	215	0.062	215	0.00097	180	0.393
		220	0.070	220	0.00108	185	0.393
		225	0.078	225	0.00121	190	0.393
		230	0.088	230	0.00134	195	0.393
		235	0.098	235	0.00149	200	0.393
		240	0.110	240	0.00165	205	0.393
		245	0.122	245	0.00183	210	0.393
		250	0.136	250	0.00202	215	0.393
		255	0.151	255	0.00223	220	0.393
		260	0.168	260	0.00245	225	0.393
		265	0.186	265	0.00270	230	0.393
		270	0.206	270	0.00297	235	0.393
		275	0.227	275	0.00326	240	0.393
		280	0.251	280	0.00357	245	0.393
		285	0.276	285	0.00391		
		290	0.304	290	0.00427		
		295	0.334	295	0.00467		
		300	0.367	300	0.00509		
		305	0.403	305	0.00554		
		310	0.441	310	0.00603		
		315	0.482	315	0.00655		
		320	0.527	320	0.00712		
		325	0.575	325	0.00772		
		330	0.627	330	0.00836		
		335	0.683	335	0.00905		
		340	0.743	340	0.00978		

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## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid Green to Blue

Sinks and mixes with water.

Protect water intakes.  
Notify local health and pollution control agencies.

### Fire

Fire data not available.

### Exposure

CALL FOR MEDICAL AID.

SOLID  
Harmful if swallowed.  
Irritating to skin and eyes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.

### Water Pollution

Effects of low concentrations on aquatic life are unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Cu}(\text{C}_6\text{H}_5\text{O}_2)_2 \cdot 2\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51391

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Currently not available
- 3.2 Symptoms Following Exposure: INHALATION: Inhalation of dust may cause nasal congestion. EYES: Conjunctivitis and edema of eyelids. SKIN: Irritation. INGESTION: Vomiting caused by local irritant and astringent action of ionic copper on stomach and bowel.
- 3.3 Treatment of Exposure: Call a physician. EYES: Wash with water. SKIN: Wash with water. INGESTION: Induce vomiting.
- 3.4 TLV-TWA: Notice of intended change: 0.05 mg Cu/m<sup>3</sup> respirable particles
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Copper poisoning in animals leads to injury of the liver, kidneys, and spleen.
- 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 100 mg Cu/m<sup>3</sup> (dusts, mists, fumes)
- 3.14 OSHA PEL-TWA: 0.1 mg/m<sup>3</sup> as copper
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Currently not available
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Currently not available
- 4.4 Fire Extinguishing Agents Not to Be Used: Currently not available
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not Pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not Pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Currently not available
- 5.4 Neutralizing Agents for Acids and Cautics: Currently not available
- 5.5 Polymerization: Currently not available
- 5.6 Inhibitor of Polymerization: Currently not available

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available
- 7.2 Storage Temperature: Currently not available
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 277.71
- 9.3 Boiling Point at 1 atm: Currently not available
- 9.4 Freezing Point: Currently not available
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: Currently not available
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Currently not available
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Currently not available
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
45	212.000		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# CHLORINE

CLX

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquefied compressed gas Greenish yellow Irritating, bleach-like choking odor

Sinks and boils in water. Poisonous, visible vapor cloud is produced.

Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR.  
Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).  
Evacuate area in case of large discharge.  
Stay upwind and use water spray to "knock down" vapor.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
May cause fire on contact with combustibles.  
POISONOUS GASES ARE PRODUCED IN FIRES.  
Stop flow of gas if possible.  
Cool exposed containers and protect men effecting shutoff with water.  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).

### Exposure

CALL FOR MEDICAL AID.  
  
VAPOR  
POISONOUS IF INHALED.  
Will burn eyes.  
Move to fresh air.  
If breathing has stopped, give artificial respiration (but NOT mouth-to-mouth).  
If breathing is difficult, give oxygen.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
  
LIQUID  
Will burn skin and eyes.  
Will cause frostbite.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
DO NOT RUB AFFECTED AREAS.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Cl<sub>2</sub>  
2.3 IMO/UN Designation: 2.0/1017  
2.4 DOT ID No.: 1017  
2.5 CAS Registry No.: 7782-50-5  
2.6 NAERG Guide No.: 124  
2.7 Standard Industrial Trade Classification: 52224

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Quick-opening safety shower and eye fountain; respiratory equipment approved for chlorine service. Wear safety goggles at all times when in vicinity of liquid chlorine.
- 3.2 **Symptoms Following Exposure:** Eye irritation, sneezing, copious salivation, general excitement and restlessness. Irritation may persist for several days. High concentrations cause respiratory distress and violent coughing, often with retching. Death may result from suffocation.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from source of exposure; call a doctor; support respiration; administer oxygen. EYES: flush with copious amounts of water for at least 15 min.
- 3.4 TLV-TWA: 0.5 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: 1 ppm.
- 3.7 **Toxicity by Ingestion:** Not pertinent; ingestion unlikely (chlorine is a gas above -34.5°C)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** 3.5 ppm
- 3.13 **IDLH Value:** 10 ppm
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** 1 ppm.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Currently not available
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic products are generated when combustibles burn in chlorine.
- 4.6 **Behavior in Fire:** Most combustibles will burn in chlorine, although gas is not flammable.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Forms a corrosive solution
- 5.2 **Reactivity with Common Materials:**  
Reacts vigorously with most metals at high temperature. Copper may burn spontaneously.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.08 ppm/168 hr/trout/TL<sub>m</sub>/fresh water  
10 ppm/1 hr/tunicates/killed/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: N/A  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research purity; ultra high purity; high purity
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief (300 psi)
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison Gas
- 8.2 **49 CFR Class:** 2.3
- 8.3 **49 CFR Package Group:** Not pertinent
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
| Special (White).....      | OX             |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 70.91
- 9.3 **Boiling Point at 1 atm:** -29.4°F = -34.1°C = 239.1°K
- 9.4 **Freezing Point:** -150°F = -101°C = 172°K
- 9.5 **Critical Temperature:** 291.2°F = 144°C = 417.2°K
- 9.6 **Critical Pressure:** 1118 psia = 76.05 atm = 7.704 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.424 at 15°C (liquid)
- 9.8 **Liquid Surface Tension:** 26.55 dynes/cm at -35.3°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 2.4
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.325
- 9.12 **Latent Heat of Vaporization:** 124 Btu/lb = 68.7 cal/g = 2.87 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 22.8 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 155 psia

### NOTES

# CHLORINE

CLX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-35 -30	97.179 96.730		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.650	-55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50	7.491 8.580 9.795 11.150 12.650 14.310 16.140 18.150 20.370 22.790 25.450 28.340 31.490 34.910 38.610 42.620 46.950 51.620 56.650 62.050 67.839 74.040	-55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50	0.12230 0.13840 0.15600 0.17550 0.19670 0.22000 0.24530 0.27280 0.30260 0.33490 0.36970 0.40720 0.44760 0.49090 0.53730 0.58700 0.63990 0.69640 0.75650 0.82030 0.88790 0.95960	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.112 0.113 0.114 0.114 0.115 0.116 0.116 0.117 0.118 0.118 0.119 0.119 0.120 0.120 0.120 0.121 0.121 0.121 0.122 0.122 0.122 0.122 0.122

**CMA**

### Common Synonyms

Chromic acid  
Chromic oxide  
Chromium trioxide

Solid flakes or powder    Dark red

Odorless

Sinks and mixes with water.

- Keep people away. Avoid contact with solid and dust.
- Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
- Stay upwind and use water spray to "knock down" dust.
- Notify local health and pollution control agencies.
- Protect water intakes.

## Fire

Not flammable.  
May cause fire on contact with combustibles.  
Containers may explode when heated in a fire.  
Extinguish with water.  
Cool exposed containers with water.

## Exposure

CALL FOR MEDICAL AID.

**SOLID**  
Will burn skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
**DO NOT INDUCE VOMITING.**

## Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** CrO<sub>3</sub>  
2.3 **IMO/UN Designation:** 5.1/1463  
2.4 **DOT ID No.:** 1463  
2.5 **CAS Registry No.:** 1333-82-0  
2.6 **NAERG Guide No.:** 141  
2.7 **Standard Industrial Trade Classification:**  
52252

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles and respirator. (Special chromic acid filters are available for respirators to prevent inhalation of dust or mist.)
- 3.2 **Symptoms Following Exposure:** Very irritating to eyes and respiratory tract. Ingestion causes severe gastrointestinal symptoms. Contact with eyes or skin causes burns; prolonged contact produces dermatitis ("chrome sores").
- 3.3 **Treatment of Exposure:** INGESTION: call a physician; do NOT induce vomiting. SKIN OR EYES: wash eyes thoroughly for at least 15 min.; flush contacted skin areas with water; remove contaminated clothing and wash before reuse.
- 3.4 **TLV-TWA:** 0.05 mg/m<sup>3</sup> as Cr
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Lung cancer
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact; very injurious to the eyes.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 15 mg/m<sup>3</sup> as Cr(+6)
- 3.14 **OSHA PEL-TWA:** 1 mg/m<sup>3</sup> as Cr
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEG:** Not listed.

#### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode
- 4.7 **Auto Ignition Temperature:** May ignite organic materials on contact.
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** May react with organic materials rapidly enough to generate sufficient heat to cause ignition. Prolonged contact, particularly on wood floors, may produce a fire hazard.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 0.01 ppm/48 hr/daphnia/TL<sub>m</sub> 52 ppm/96 hr/goldfish/died
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; technical flake: 99.75%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer
- 8.2 49 CFR Class: 5.1
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 1              |
- 8.6 EPA Reportable Quantity: 10 pounds
- 8.7 EPA Pollution Category: A
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 100.01
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.70 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 37.7 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# CHROMIC ANHYDRIDE

CMA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	161.299		N		N		N
36	161.699		O		O		O
38	162.000		T		T		T
40	162.299						
42	162.699		P		P		P
44	163.000		E		E		E
46	163.299		R		R		R
48	163.699		T		T		T
50	164.000		I		I		I
52	164.299		N		N		N
54	164.699		E		E		E
56	165.000		N		N		N
58	165.299		E		E		E
60	165.699		N		N		N
62	166.000		T		T		T
64	166.299						
66	166.699						
68	167.000						
70	167.299						
72	167.699						
74	168.000						
76	168.299						
78	168.699						
80	169.000						
82	169.299						
84	169.699						

# CADMIUM BROMIDE

CMB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cadmium bromide tetrahydrate	Solid	White	Odorless
Mixes with water.			
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear dust respirator and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. If swallowed will cause nausea, vomiting and loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CdBr}_2 \cdot 4\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2570
- 2.5 CAS Registry No.: 7789-42-6
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; rubber gloves
- 3.2 **Symptoms Following Exposure:** Inhalation causes coughing, sneezing, symptoms of lung damage. Ingestion produces severe toxic symptoms; both kidney and liver injuries may occur. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove patient to fresh air; seek medical attention. INGESTION: induce vomiting; allow GI irritation by giving milk or egg whites at frequent intervals; perform gastric lavage; seek medical attention. EYES: flush with water for at least 15 min.
- 3.4 **TLV-TWA:** 0.01 mg Cd/m<sup>3</sup> inhalable; 0.002 mg Cd/m<sup>3</sup> respirable fraction.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> <50 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Delayed liver, kidney, and lung damage has followed respiratory exposure to cadmium salts in industry.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 9 mg/m<sup>3</sup> as Cd
- 3.14 **OSHA PEL-TWA:** 0.005 mg/m<sup>3</sup> as Cd
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic cadmium oxide fumes may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Concentrated by shellfish.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 99.5%; Anhydrous, 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 344.27
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** >1.1 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -2.3 Btu/lb = -1.3 cal/g = -0.054 X 10<sup>3</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 18.4 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CADMIUM BROMIDE

CMB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	58.600		N		N		N
36	60.960		O		O		O
38	63.310		T		T		T
40	65.669						
42	68.020		P		P		P
44	70.379		E		E		E
46	72.730		R		R		R
48	75.089		T		T		T
50	77.450		I		I		I
52	79.799		N		N		N
54	82.160		E		E		E
56	84.509		N		N		N
58	86.870		E		E		E
60	89.219		N		N		N
62	91.580		T		T		T
64	93.929						
66	96.290						
68	98.650						
70	101.000						
72	103.400						
74	105.700						
76	108.099						
78	110.400						
80	112.799						
82	115.099						
84	117.500						

# CHROMYL CHLORIDE

CMC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chromium (VI) dioxychloride Chromium oxychloride	Liquid	Dark red	Unpleasant odor
Reacts violently with water. Irritating visible vapor cloud is produced.			
Evacuate. Keep people away. Avoid contact with liquid and vapor. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. Irritating gases are produced when heated. Containers may explode in fire. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CrO<sub>2</sub>Cl<sub>2</sub>  
2.3 IMO/UN Designation: 8/1758  
2.4 DOT ID No.: 1758  
2.5 CAS Registry No.: 7791-14-2  
2.6 NAERG Guide No.: 137  
2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus (full face); rubber gloves; protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory system. Contact with eyes or skin causes irritation and burning. Ingestion causes burning of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove from exposure; support respiration. EYES: flush with copious quantities of water for 15 min. SKIN: flush with water for 15 min. INGESTION: do NOT induce vomiting; give large amounts of water.
- 3.4 **TLV-TWA:** 0.025 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> < 50 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 15 mg/m<sup>3</sup> as Cr(+6)
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable, but may cause fire on contact with combustible materials.
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water on adjacent fires unless fully protected against toxic fumes.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Vapors are very irritating to eyes and mucous membranes. May increase severity of fire.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently to form hydrogen chloride (hydrochloric acid) and chlorine gases and chromic acid.
- 5.2 **Reactivity with Common Materials:** Will cause severe corrosion of common metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water. Rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.5+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 154.9
- 9.3 **Boiling Point at 1 atm:** 241°F = 116°C = 389°K
- 9.4 **Freezing Point:** -141.7°F = -96.5°C = 176.7°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.96 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 36.61 dynes/cm = 0.03661 N/m at 19°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 5.3
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.2832
- 9.12 **Latent Heat of Vaporization:** 113 Btu/lb = 62.6 cal/g = 2.62 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -279 Btu/lb = -155 cal/g = -6.48 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CHROMYL CHLORIDE

CMC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	124.500	52	0.451	51	1.048	51	0.954
36	124.400	54	0.452	52	1.048	52	0.945
38	124.299	56	0.453	53	1.048	53	0.937
40	124.099	58	0.454	54	1.048	54	0.928
42	124.000	60	0.456	55	1.048	55	0.920
44	123.900	62	0.457	56	1.048	56	0.912
46	123.799	64	0.458	57	1.048	57	0.904
48	123.599	66	0.459	58	1.048	58	0.896
50	123.500	68	0.460	59	1.048	59	0.888
52	123.400	70	0.461	60	1.048	60	0.880
54	123.200	72	0.462	61	1.048	61	0.872
56	123.099	74	0.463	62	1.048	62	0.865
58	123.000	76	0.464	63	1.048	63	0.857
60	122.900	78	0.466	64	1.048	64	0.850
62	122.700	80	0.467	65	1.048	65	0.842
64	122.599	82	0.468	66	1.048	66	0.835
66	122.500	84	0.469	67	1.048	67	0.828
68	122.299	86	0.470	68	1.048	68	0.821
70	122.200			69	1.048	69	0.814
72	122.099			70	1.048	70	0.807
74	122.000			71	1.048	71	0.800
76	121.799			72	1.048	72	0.794
78	121.700			73	1.048	73	0.787
80	121.599			74	1.048	74	0.780
82	121.400			75	1.048	75	0.774
84	121.299			76	1.048	76	0.768

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	40	0.095	40	0.00273	30	0.058
	E	50	0.134	50	0.00378	35	0.058
	A	60	0.186	60	0.00517	40	0.058
	C	70	0.256	70	0.00698	45	0.058
	T	80	0.349	80	0.00932	50	0.058
	S	90	0.469	90	0.01231	55	0.058
		100	0.624	100	0.01608	60	0.058
		110	0.822	110	0.02082	65	0.058
		120	1.072	120	0.02669	70	0.058
		130	1.387	130	0.03393	75	0.058
		140	1.778	140	0.04278	80	0.058
		150	2.261	150	0.05351	85	0.058
		160	2.853	160	0.06643	90	0.058
		170	3.573	170	0.08188	95	0.058
		180	4.444	180	0.10020	100	0.058
		190	5.490	190	0.12190	105	0.058
		200	6.739	200	0.14740	110	0.058
		210	8.222	210	0.17720	115	0.058
		220	9.973	220	0.21170		
		230	12.030	230	0.25170		
		240	14.430	240	0.29760		

# CHLOROMETHYL METHYL ETHER

CME

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methyl chloromethyl ether, anhydrous Monochloromethyl ether	Liquid  Colorless  Irritating odor  May float or sink in water. Poisonous, flammable vapor is produced.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{ClCH}_2\text{OCH}_3$   
2.3 IMO/UN Designation: 3.1/1239  
2.4 DOT ID No.: 1239  
2.5 CAS Registry No.: 107-30-2  
2.6 NAERG Guide No.: 131  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; goggles; rubber gloves; protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes sore throat, fever, chills, difficulty in breathing. Contact of liquid with eyes causes severe burns and necrosis; vapor is a powerful tear gas. Skin contact causes severe burns and necrosis. Ingestion causes severe burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; support respiration; call physician. EYES: wash with copious quantities of water for at least 15 min.; call physician. SKIN: wash with large amounts of water. INGESTION: do NOT induce vomiting; give large amounts of water; call a physician.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 817 \text{ mg/kg}$  (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Considered to be lung cancer-producing.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Carcinogen-all contact should be avoided  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 0°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride and phosgene gases may be formed.  
4.6 **Behavior in Fire:** Unburned material may form powerful tear gas. When wet, also forms irritating formaldehyde gas.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 3.0 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 11.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts to evolve formaldehyde and hydrogen chloride. The reaction is not violent.  
5.2 **Reactivity with Common Materials:** Will react with surface moisture to evolve hydrogen chloride, which is corrosive to metal.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water. Rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** U046  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 80.5  
9.3 **Boiling Point at 1 atm:** 140°F = 60°C = 333°K  
9.4 **Freezing Point:** -154.3°F = -103.5°C = 169.7°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.07 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.8  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1195  
9.12 **Latent Heat of Vaporization:** (est.) 154 Btu/lb = 85.6 cal/g =  $3.58 \times 10^5 \text{ J/kg}$   
9.13 **Heat of Combustion:** (est.) -7,300 Btu/lb = -4,100 cal/g =  $-170 \times 10^5 \text{ J/kg}$   
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CHLOROMETHYL METHYL ETHER

CME

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	68.570	34	0.431	34	1.048	34	0.251
36	68.480	36	0.432	36	1.048	36	0.248
38	68.389	38	0.433	38	1.048	38	0.245
40	68.299	40	0.434	40	1.048	40	0.242
42	68.209	42	0.436	42	1.048	42	0.239
44	68.120	44	0.437	44	1.048	44	0.237
46	68.030	46	0.438	46	1.048	46	0.234
48	67.940	48	0.439	48	1.048	48	0.231
50	67.849	50	0.440	50	1.048	50	0.229
52	67.759	52	0.441	52	1.048	52	0.226
54	67.669	54	0.442	54	1.048	54	0.224
56	67.580	56	0.443	56	1.048	56	0.221
58	67.490	58	0.444	58	1.048	58	0.219
60	67.400	60	0.446	60	1.048	60	0.217
62	67.309	62	0.447	62	1.048	62	0.214
64	67.219	64	0.448	64	1.048	64	0.212
66	67.129	66	0.449	66	1.048	66	0.210
68	67.040	68	0.450	68	1.048	68	0.208
70	66.950	70	0.451	70	1.048	70	0.206
72	66.860	72	0.452	72	1.048	72	0.204
74	66.770	74	0.453	74	1.048	74	0.201
76	66.679	76	0.454	76	1.048	76	0.199
78	66.589	78	0.456	78	1.048	78	0.197
80	66.500	80	0.457	80	1.048	80	0.196
82	66.410	82	0.458	82	1.048	82	0.194
84	66.320	84	0.459	84	1.048	84	0.192

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	3.705	70	0.05245	0	0.214
	N	75	4.137	75	0.05802	20	0.219
	S	80	4.610	80	0.06406	40	0.224
	O	85	5.127	85	0.07059	60	0.229
	L	90	5.691	90	0.07764	80	0.234
	U	95	6.305	95	0.08524	100	0.239
	B	100	6.972	100	0.09342	120	0.243
	L	105	7.696	105	0.10220	140	0.248
	E	110	8.481	110	0.11160	160	0.253
		115	9.331	115	0.12180	180	0.257
		120	10.250	120	0.13260	200	0.262
		125	11.240	125	0.14410	220	0.266
		130	12.300	130	0.15650	240	0.271
		135	13.450	135	0.16960	260	0.275
		140	14.680	140	0.18360	280	0.280
						300	0.284
						320	0.288
						340	0.292
						360	0.296
						380	0.301
						400	0.305
						420	0.309
						440	0.313

# CUMENE HYDROPEROXIDE

CMH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> CHP Cumyl hydroperoxide alpha,alpha-Dimethylbenzene hydroperoxide Dimethylbenzyl hydroperoxide Isopropylbenzene hydroperoxide	Liquid  Colorless to light yellow  Sharp, irritating odor  Sinks in water.
<b>Keep people away.</b> <b>Avoid contact with liquid and vapor.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache or coughing. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Do not burn

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_9H_8O_2$  (OOH)(CH<sub>3</sub>)<sub>2</sub>-  
C<sub>6</sub>H<sub>5</sub>CH(CH<sub>3</sub>)<sub>2</sub> (mixture)  
2.3 IMO/UN Designation: 5.2/2116  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 80-15-9  
2.6 NAERG Guide No.: 147  
2.7 Standard Industrial Trade Classification:  
51129

## 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Self-contained or air-line breathing apparatus; solvent-resistant rubber gloves; chemical splash goggles; rubber apron; rubber or PVC clothing; full face shield.  
3.2 **Symptoms Following Exposure:** Inhalation of vapor causes headache and burning throat. Liquid causes severe irritation of eyes; on skin, causes burning, throbbing sensation, irritation, and blisters. Ingestion causes irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** Get medical attention after all exposures to this compound. INHALATION: remove victim and administer artificial respiration and oxygen if necessary. EYES: flush with water for 15 min. SKIN: wash several times with soap and water; treat as burn. INGESTION: induce vomiting and follow with gastric lavage.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 382 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

4.1 **Flash Point:** 147°F O.C. 120°F C.C.  
4.2 **Flammable Limits in Air:** 0.9%-6.5%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Toxic phenol vapors may form from hot material.  
4.6 **Behavior in Fire:** May decompose violently when heated. Burning rate becomes more rapid as fire burns.  
4.7 **Auto Ignition Temperature:** Decomposes violently at temperature above 300°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Decomposition is catalyzed by metals such as aluminum, copper, brass, zinc, and lead. The reaction is not hazardous unless hot.  
5.3 **Stability During Transport:** Stable if kept below 125°F and out of direct sunlight.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 77-85%, the balance being cumene hydrocarbon.  
7.2 **Storage Temperature:** Below 125°F  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Containers must be stored in well-ventilated area.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	4
Special (White).....	OX

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: U096  
8.9 EPA FWPCL List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Mixture  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** 16°F = -9°C = 264°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.03 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -13,300 Btu/lb = -7,400 cal/g = -310 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** -855 Btu/lb = -475 cal/g = -19.9 X 10<sup>5</sup> J/kg  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# CUMENE HYDROPEROXIDE

CMH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
51	65.200	51	0.450	51	1.048	51	30.850
52	65.160	52	0.450	52	1.048	52	29.840
53	65.129	53	0.450	53	1.048	53	28.880
54	65.089	54	0.450	54	1.048	54	27.940
55	65.059	55	0.450	55	1.048	55	27.050
56	65.020	56	0.450	56	1.048	56	26.180
57	64.990	57	0.450	57	1.048	57	25.340
58	64.950	58	0.450	58	1.048	58	24.540
59	64.919	59	0.450	59	1.048	59	23.760
60	64.879	60	0.450	60	1.048	60	23.010
61	64.849	61	0.450	61	1.048	61	22.290
62	64.809	62	0.450	62	1.048	62	21.590
63	64.780	63	0.450	63	1.048	63	20.920
64	64.750	64	0.450	64	1.048	64	20.270
65	64.709	65	0.450	65	1.048	65	19.640
66	64.679	66	0.450	66	1.048	66	19.030
67	64.639	67	0.450	67	1.048	67	18.450
68	64.610	68	0.450	68	1.048	68	17.880
69	64.570	69	0.450	69	1.048	69	17.340
70	64.540	70	0.450	70	1.048	70	16.810
71	64.500	71	0.450	71	1.048	71	16.300
72	64.469	72	0.450	72	1.048	72	15.810
73	64.429	73	0.450	73	1.048	73	15.340
74	64.400	74	0.450	74	1.048	74	14.880
75	64.360	75	0.450	75	1.048	75	14.430
76	64.330	76	0.450	76	1.048	76	14.000

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	0.003		N		N
	N	62	0.004		O		O
	S	64	0.004		T		T
	O	66	0.004				
	L	68	0.005		P		P
	U	70	0.005		E		E
	B	72	0.005		R		R
	I	74	0.006		T		T
	E	76	0.006		I		I
		78	0.007		N		N
		80	0.008		E		E
		82	0.008		N		N
		84	0.009		T		T
		86	0.010				
		88	0.010				
		90	0.011				
		92	0.012				
		94	0.013				
		96	0.014				
		98	0.015				
		100	0.017				
		102	0.018				
		104	0.019				

# CADMIUM NITRATE

CMN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cadmium nitrate tetrahydrate	Solid	White	Odorless
Sinks in water.			
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Shut off ignition sources and call fire department. Wear a dust respirator. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. If inhaled will cause headache, coughing, or difficult breathing If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** Cd(NO<sub>3</sub>)<sub>2</sub>·4H<sub>2</sub>O  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** 2570  
2.5 **CAS Registry No.:** 10022-68-1  
2.6 **NAERG Guide No.:** 154  
2.7 **Standard Industrial Trade Classification:** 52359

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; safety goggles; dust mask  
3.2 **Symptoms Following Exposure:** Inhalation of fumes can produce coughing, chest constriction, headache, nausea, vomiting, pneumonitis. Chronic poisoning is characterized by emphysema and kidney injury. Ingestion causes gastrointestinal disturbance and severe toxic symptoms; both kidney and liver injuries may occur. Contact with eyes causes irritation.  
3.3 **Treatment of Exposure:** INHALATION: remove patient to fresh air; seek medical attention. INGESTION: give large amounts of water and induce vomiting; give milk or egg whites; seek medical attention. EYES: flush with copious amounts of water for 15 min.; consult a physician. SKIN: wash with soap and water.  
3.4 **TLV-TWA:** 0.01 mg Cd/m<sup>3</sup> inhalable; 0.002 mg Cd/m<sup>3</sup> respirable fraction.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral mouse LD<sub>50</sub> = 100 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Delayed liver, lung, and kidney damage has followed respiratory exposures to cadmium salts in industry.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 9 mg/m<sup>3</sup> as Cd  
3.14 **OSHA PEL-TWA:** 0.005 mg/m<sup>3</sup> as Cd  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and cadmium oxide fume may form in fires.  
4.6 **Behavior in Fire:** Will increase intensity of fire when in contact with combustible material  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.056 ppm\*/\*\*/guppy/LD<sub>50</sub>/fresh water  
0.2 ppm/10 days/stickleback/killed/ fresh water  
\*As cadmium  
\*\*Time period not specified  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** Shellfish concentrate 900-1600 times  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 308.47  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** 138°F = 59°C = 332°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 2.45 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** 29.7 Btu/lb = 16.5 cal/g = 0.691 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CADMIUM NITRATE

CMN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	123.599		N		N		N
36	125.200		O		O		O
38	126.900		T		T		T
40	128.500						
42	130.099		P		P		P
44	131.699		E		E		E
46	133.400		R		R		R
48	135.000		T		T		T
50	136.599		I		I		I
52	138.199		N		N		N
54	139.799		E		E		E
56	141.500		N		N		N
58	143.099		E		E		E
60	144.699		N		N		N
62	146.299		T		T		T
64	148.000						
66	149.599						
68	151.199						
70	152.799						
72	154.400						
74	156.099						
76	157.699						
78	159.299						
80	160.900						
82	162.599						
84	164.199						

# CARBON MONOXIDE

CMO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Monoxide	Compressed gas or liquefied compressed gas  Colorless  Odorless  Liquid floats and boils on water. Poisonous, flammable visible vapor cloud is produced.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Evacuate area in case of large discharge. Notify local health and pollution control agencies.	
<b>Fire</b>	<b>FLAMMABLE.</b> Containers may explode in fire. Wear goggles and self-contained breathing apparatus. Let fire burn. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> <b>POISONOUS IF INHALED.</b> Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Will cause frostbite. Flush affected areas with plenty of water. <b>DO NOT RUB AFFECTED AREAS.</b>
<b>Water Pollution</b>	<b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:** CO
- 2.3 **IMO/UN Designation:** 2/1016
- 2.4 **DOT ID No.:** 1016
- 2.5 **CAS Registry No.:** 630-08-0
- 2.6 **NAERG Guide No.:** 119
- 2.7 **Standard Industrial Trade Classification:** 52239

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; safety glasses and safety shoes; Type D or Type N canister mask.
- 3.2 **Symptoms Following Exposure:** Inhalation causes headache, dizziness, weakness of limbs, confusion, nausea, unconsciousness, and finally death. 0.04% conc., 2-3 hr. or .06% conc., 1 hr - headache and discomfort; with moderate exercise, 0.1-0.2% will produce throbbing in the head in about 1/2 hr., a tendency to stagger in about 1 1/2 hr., and confusion of the mind, headache, and nausea in about 2 hrs. 0.20-25% usually produces unconsciousness in about 1/2 hr. Inhalation of a 0.4% conc. can prove fatal in less than 1 hr. Inhalation of high concentrations can cause sudden, unexpected collapse. Contact of liquid with skin will cause frostbite.
- 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; give oxygen if available; support respiration; call a doctor. SKIN: if burned by liquid, treat as frostbite.
- 3.4 **TLV-TWA:** 25 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent (gas with low boiling point)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Toxicity from overexposure persists for many days.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 1,200 ppm
- 3.14 **OSHA PEL-TWA:** 50 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent
- 4.2 **Flammable Limits in Air:** 12%-75%
- 4.3 **Fire Extinguishing Agents:** Let fire burn; shut off flow of gas and cool adjacent exposures with water. Extinguish (only if wearing self-contained breathing apparatus) with dry chemicals or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Asphyxiation due to carbon dioxide production may result.
- 4.6 **Behavior in Fire:** Flame has very little color. Containers may explode in fire.
- 4.7 **Auto Ignition Temperature:** 1,128°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** 2701. (Est.)
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.5 ppm/1-6 hr/minnows and sunfish/killed/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Liquid: 98.6+%; Gas: Research High Purity; CP (99.5%); Technical (99.0+%); Commercial (97.5+%)
- 7.2 **Storage Temperature:** Ambient (for gas); -312.7°F (for liquid)
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison Gas
- 8.2 **49 CFR Class:** 2.3
- 8.3 **49 CFR Package Group:** Not pertinent
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 28.0
- 9.3 **Boiling Point at 1 atm:** -312.7°F = -191.5°C = 81.7°K
- 9.4 **Freezing Point:** -326°F = -199°C = 74°K
- 9.5 **Critical Temperature:** -220°F = -140°C = 133°K
- 9.6 **Critical Pressure:** 507.5 psia = 34.51 atm = 3.502 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.791 at -191.5°C (liquid)
- 9.8 **Liquid Surface Tension:** 9.8 dynes/cm = 0.098 N/m at -193°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.3962
- 9.12 **Latent Heat of Vaporization:** 92.8 Btu/lb = 51.6 cal/g = 2.16 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -4,343 Btu/lb = -2,412 cal/g = -101 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 7.13 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CARBON MONOXIDE

CMO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-326	49.870	-326	0.510	-309	0.949	-318	0.018
-325	49.830	-325	0.510	-308	0.942	-316	0.018
-324	49.800	-324	0.510	-307	0.935	-314	0.017
-323	49.760	-323	0.510	-306	0.928	-312	0.016
-322	49.730	-322	0.510	-305	0.922	-310	0.016
-321	49.690	-321	0.510	-304	0.915	-308	0.015
-320	49.660	-320	0.510	-303	0.908	-306	0.015
-319	49.630	-319	0.510	-302	0.902	-304	0.014
-318	49.590	-318	0.510	-301	0.895	-302	0.014
-317	49.560	-317	0.510	-300	0.888	-300	0.013
-316	49.520	-316	0.510	-299	0.881	-298	0.013
-315	49.490	-315	0.510	-298	0.875	-296	0.012
-314	49.450	-314	0.510	-297	0.868	-294	0.012
-313	49.420	-313	0.510	-296	0.861	-292	0.012
-312	49.380	-312	0.510	-295	0.855	-290	0.011
-311	49.350	-311	0.510	-294	0.848	-288	0.011
-310	49.310	-310	0.510	-293	0.841	-286	0.011
-309	49.280			-292	0.834	-284	0.010
-308	49.240			-291	0.828		
-307	49.210			-290	0.821		
-306	49.170			-289	0.814		
-305	49.140			-288	0.808		
-304	49.110			-287	0.801		
-303	49.070			-286	0.794		
-302	49.040			-285	0.787		
-301	49.000			-284	0.781		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
32	0.004	-326	5.310	-326	0.10360	100	0.250
		-324	6.243	-324	0.12000	120	0.250
		-322	7.304	-322	0.13840	140	0.250
		-320	8.508	-320	0.15890	160	0.250
		-318	9.867	-318	0.18170	180	0.250
		-316	11.400	-316	0.20690	200	0.250
		-314	13.110	-314	0.23480	220	0.250
		-312	15.020	-312	0.26540	240	0.250
		-310	17.160	-310	0.29900	260	0.250
		-308	19.520	-308	0.33570	280	0.250
		-306	22.140	-306	0.37580	300	0.250
		-304	25.020	-304	0.41930	320	0.250
		-302	28.200	-302	0.46650	340	0.250
		-300	31.680	-300	0.51750	360	0.250
		-298	35.490	-298	0.57260	380	0.250
		-296	39.650	-296	0.63180	400	0.250
		-294	44.170	-294	0.69550	420	0.250
		-292	49.090	-292	0.76360	440	0.250

# P-CYMENE

CMP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cymol p-Isopropyltoluene Isopropyltoluol 1-Methyl-4-isopropylbenzene Methylpropylbenzene	Liquid  Colorless  Mild pleasant odor  Floats on water.
Keep people away. Avoid contact with liquid and vapor. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 32; Aromatic Hydrocarbon  
2.2 Formula:  $p\text{-CH}_3\text{C}_6\text{H}_4\text{CH}(\text{CH}_3)_2$   
2.3 IMO/UN Designation: 3.3/2046  
2.4 DOT ID No.: 2046  
2.5 CAS Registry No.: 99-87-6  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained or air-line breathing apparatus; solvent-resistant rubber gloves; chemical splash goggles.  
3.2 **Symptoms Following Exposure:** Inhalation causes impairment of coordination, headache. Contact with liquid causes mild irritation of eyes and skin. Ingestion causes irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove victim from contaminated area; administer artificial respiration if necessary; call physician. EYES: flush with water for 15 min.; call a physician. SKIN: wipe off liquid; wash well with soap and water. INGESTION: induce vomiting; get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat  $\text{LD}_{50}$  = 4,750 mg/kg. Oral human  $\text{TD}_{10}$  = 86 mg/kg (affects central nervous system)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 140°F O.C. 117°F C.C.  
4.2 **Flammable Limits in Air:** 0.7%-5.6%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 817°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 6.1 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 64.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 17.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 5000 pounds  
8.7 EPA Pollution Category: D  
8.8 RCRA Waste Number: U055  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 134.2  
9.3 **Boiling Point at 1 atm:** 351°F = 177°C = 450°K  
9.4 **Freezing Point:** -90.2°F = -67.9°C = 205.3°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.857 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 28.09 dynes/cm = 0.02809 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 36.41 dynes/cm = 0.03641 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 122 Btu/lb = 67.8 cal/g =  $2.84 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -18,800 Btu/lb = -10,400 cal/g =  $-437 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 17.10 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

### NOTES

# P-CYMENE

CMP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	54.430	30	0.410	51	0.853	35	1.105
40	54.290	40	0.415	52	0.853	40	1.059
45	54.150	50	0.420	53	0.853	45	1.015
50	54.010	60	0.424	54	0.853	50	0.974
55	53.880	70	0.429	55	0.853	55	0.936
60	53.740	80	0.434	56	0.853	60	0.900
65	53.600	90	0.438	57	0.853	65	0.866
70	53.460	100	0.443	58	0.853	70	0.833
75	53.320	110	0.448	59	0.853	75	0.803
80	53.180	120	0.452	60	0.853	80	0.774
85	53.040	130	0.457	61	0.853	85	0.747
90	52.900	140	0.462	62	0.853	90	0.721
95	52.770	150	0.466	63	0.853	95	0.696
100	52.630	160	0.471	64	0.853	100	0.673
		170	0.475	65	0.853	105	0.651
		180	0.480	66	0.853	110	0.630
		190	0.485	67	0.853	115	0.610
		200	0.489	68	0.853	120	0.591
				69	0.853	125	0.572
				70	0.853	130	0.555
				71	0.853	135	0.539
				72	0.853	140	0.523
				73	0.853		
				74	0.853		
				75	0.853		
				76	0.853		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	0.018	60	0.00042		N
	N	70	0.025	70	0.00059		O
	S	80	0.035	80	0.00082		T
	O	90	0.049	90	0.00111		
	L	100	0.067	100	0.00150		P
	U	110	0.091	110	0.00200		E
	B	120	0.122	120	0.00264		R
	L	130	0.163	130	0.00345		T
	E	140	0.214	140	0.00447		I
		150	0.280	150	0.00574		N
		160	0.362	160	0.00731		E
		170	0.465	170	0.00923		N
		180	0.592	180	0.01157		T
		190	0.748	190	0.01440		
		200	0.939	200	0.01780		
		210	1.171	210	0.02186		
		220	1.450	220	0.02668		
		230	1.785	230	0.03236		
		240	2.184	240	0.03903		
		250	2.658	250	0.04682		
		260	3.216	260	0.05587		
		270	3.872	270	0.06633		
		280	4.637	280	0.07838		
		290	5.527	290	0.09218		
		300	6.558	300	0.10790		
		310	7.747	310	0.12580		

# CADMIUM SULFATE

CMS

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Solid                      White                      Odorless  Sinks and mixes slowly with water.
<p><b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b>  Wear a dust respirator.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
Fire	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
Exposure	<p>CALL FOR MEDICAL AID.  DUST  POISONOUS IF INHALED.  If inhaled will cause headache, coughing, or difficult breathing  If in eyes, hold eyelids open and flush with plenty of water.  If breathing has stopped, give artificial respiration.  If breathing is difficult, give oxygen.</p> <p>SOLID  POISONOUS IF SWALLOWED.  Irritating to skin and eyes.  If swallowed will cause nausea and vomiting.  Remove contaminated clothing and shoes.  Flush affected areas with plenty of water.  IF IN EYES, hold eyelids open and flush with plenty of water.  IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CdSO<sub>4</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2570  
2.5 CAS Registry No.: 10124-36-4  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 52349

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Bu. Mines approved respirator; rubber gloves; safety goggles  
3.2 **Symptoms Following Exposure:** Inhalation may cause dryness of throat, coughing, constriction in chest, and headache. Ingestion may cause salivation, vomiting, abdominal pains, or diarrhea. Contact with eyes causes irritation.  
3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure and consult a physician. INGESTION: induce vomiting, then allay irritation with milk or egg whites given at frequent intervals; perform gastric lavage; seek medical attention. EYES: flush with water for at least 10 min.; consult a physician. SKIN: wash with soap and water.  
3.4 **TLV-TWA:** 0.01 mg Cd/m<sup>3</sup> inhalable; 0.002 mg Cd/m<sup>3</sup> respirable fraction.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral mouse LD<sub>50</sub> = 88 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Delayed liver, kidney, and lung damage has followed respiratory exposures to cadmium salts in industry.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 9 mg/m<sup>3</sup> as Cd  
3.14 **OSHA PEL-TWA:** 0.005 mg/m<sup>3</sup> as Cd  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic cadmium oxide fume may form in fires.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1000 ppm\*/fish/LC<sub>50</sub>/fresh water  
\*Time period not specified  
6.2 **Waterfowl Toxicity:** Not pertinent  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:**  
Shellfish concentrate cadmium 900-1600 times  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; 8/3 Hydrate grade; Reagent  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 208.46  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 4.7 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -92 Btu/lb = -51.3 cal/g = -2.15 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 22.9 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# CADMIUM SULFATE

CMS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	75.559		N		N		N
36	75.620		O		O		O
38	75.679		T		T		T
40	75.740						
42	75.790		P		P		P
44	75.849		E		E		E
46	75.910		R		R		R
48	75.969		T		T		T
50	76.030		I		I		I
52	76.089		N		N		N
54	76.150		E		E		E
56	76.209		N		N		N
58	76.270		E		E		E
60	76.320		N		N		N
62	76.379		T		T		T
64	76.440						
66	76.500						
68	76.559						
70	76.620						
72	76.679						
74	76.740						
76	76.799						
78	76.849						
80	76.910						
82	76.969						
84	77.030						

# 1-CHLORO-1-NITROPROPANE

CNE

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless	Unpleasant
Korax			
<b>Keep people away.</b> <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear rubber over clothing (including gloves), goggles, and approved respirator. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	COMBUSTIBLE. Wear self-contained breathing apparatus, chemical protective clothing, and gloves. Extinguish with dry chemicals, CO <sub>2</sub> , or alcohol foam. Use water spray to "knock down" vapors and cool exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID. Move victim to fresh air. Remove contaminated clothing and shoes. Wash affected areas with plenty of soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water; then induce vomiting.		
<b>Water Pollution</b>	Effects of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge.  
Dilute and disperse.  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CH<sub>3</sub>CH<sub>2</sub>CHClNO<sub>2</sub>  
2.3 IMO/UN Designation: Not listed.  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 600-25-9  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51489

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical protective clothing (impervious), gloves and face shield.  
Use approved respirator.
- 3.2 **Symptoms Following Exposure:** Human experience not reported. High concentrations caused lacrimation, nasal discharge, and pulmonary rales in rabbits.
- 3.3 **Treatment of Exposure:** CALL FOR MEDICAL AID. EYES: Flush immediately with copious amounts of water occasionally lifting lids. SKIN: Wash thoroughly with soap and water. INGESTION: If conscious drink large quantity of water immediately. After swallowing water, induce vomiting.
- 3.4 **TLV-TWA:** 2 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral mouse LD<sub>50</sub> = 510 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Causes liver, kidney, and cardiovascular disease in animals.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 100 ppm  
3.14 **OSHA PEL-TWA:** 20 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 144°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.  
4.5 **Special Hazards of Combustion Products:** May produce toxic gases, including nitrogen oxides, hydrogen chloride, and carbon monoxide.  
4.6 **Behavior in Fire:** Overheating in closed containers may cause explosions.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Will attack some plastics, rubber, and coatings (insulators).  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 20.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Reactions with strong oxidizers may cause fires and explosions.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | -              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 123.5  
9.3 **Boiling Point at 1 atm:** 285°F = 140°C = 413°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.2  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.3  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1-CHLORO-1-NITROPROPANE

CNE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.800	68	0.112	68	0.00245		C U R R E N T L Y  N O T  A V A I L A B L E

# COPPER NITRATE

CNI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cupric nitrate trihydrate Gerhardite	Solid  Blue  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. Irritating gases may be produced when heated. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn easily. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 3251-23-8  
2.6 NAERG Guide No.: Not listed.  
2.7 Standard Industrial Trade Classification: 52359

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of throat and lungs. Ingestion of large amounts causes violent vomiting and purging, intense pain, collapse, coma, convulsions, and paralysis. Solutions irritate eyes; contact with solid causes severe eye surface injury and skin irritation.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water; induce vomiting; get medical attention. EYES: flush with water for at least 15 min.; get medical attention if injury was caused by solid. SKIN: flush with water.  
3.4 **TLV-TWA:** Notice of intended change: 0.05 mg Cu/m<sup>3</sup> respirable particles  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 100 mg Cu/m<sup>3</sup> (dusts, mists, fumes)  
3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as copper  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic and irritating oxides of nitrogen may form in fire.  
4.6 **Behavior in Fire:** Can increase intensity of fire if in contact with combustible material.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Mixtures with wood, paper, and other combustibles may catch fire.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
5 ppm/11 hr/rainbow trout/killed/fresh water  
0.22-1.0 ppm/48-240 hr/barnacles & related species/killed/salt water  
1.9 ppm/96 hr/oyster/TLW/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:**  
Copper known to be accumulated by shellfish. Can be concentrated by food chain. Hazard to humans unknown.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure, 100%; Technical; Reagent. May also be shipped as anhydrous grade.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0 1            |
| Flammability (Red).....   | 0 0            |
| Instability (Yellow)..... | 0 0            |
| Special (White).....      | OX OX          |

\* First column refers to non-fire situation.  
8.6 **EPA Reportable Quantity:** 100 pounds

- 8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 241.60  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** 238.1°F = 114.5°C = 387.7°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 2.32 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COPPER NITRATE

CNI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	85.330		N O T		N O T		N O T
36	87.660						
38	90.000						
40	92.330						
42	94.660		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	97.000						
46	99.330						
48	101.700						
50	104.000						
52	106.299						
54	108.700						
56	111.000						
58	113.299						
60	115.700						
62	118.000						
64	120.299						
66	122.700						
68	125.000						
70	127.299						
72	129.699						
74	132.000						
76	134.299						
78	136.699						
80	139.000						
82	141.299						
84	143.699						

# COPPER NAPHTHENATE

CNN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Paint drier	Liquid	Dark green	Gasoline-like odor
May float or sink in water.			
Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Mixture  
2.3 IMO/UN Designation: 3.3/1168  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 1338-02-9  
2.6 NAERG Guide No.: Not listed.  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; plastic gloves (as for gasoline)
- 3.2 **Symptoms Following Exposure:** Vapor causes mild irritation of eyes and mild irritation of respiratory tract if inhaled. Ingestion causes irritation of stomach. Aspiration causes severe lung irritation and rapidly developing pulmonary edema; central nervous system excitement followed by depression.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. EYES: wash with copious amounts of water for at least 15 min. SKIN: wipe off and wash with soap and water. INGESTION: do NOT induce vomiting; guard against aspiration into lungs. ASPIRATION: enforce bed rest; give oxygen; call a doctor.
- 3.4 **TLV-TWA:** Notice of intended change: 0.05 mg Cu/m<sup>3</sup> respirable particles
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; oral rat LD<sub>50</sub> = 4-6 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to the eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 100 mg Cu/m<sup>3</sup> (dusts, mists, fumes)
- 3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as copper
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 100°F C.C. (typical)
- 4.2 **Flammable Limits in Air:** 0.8%-5.0% (mineral spirits)
- 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 540°F (mineral spirits)
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 4 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 2.0 ppm/72 hr/blue-green algae/100% kill/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 8%, 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: 1  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 8% in mineral spirits or mineral oil. 5% in mineral spirits. May float instead of sink in water.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Mixture
- 9.3 **Boiling Point at 1 atm:** 310-395°F = 154-202°C = 427-475°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.93-1.05 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** 20 dynes/cm = 0.020 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** 45 dynes/cm = 0.045 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -17,600 Btu/lb = -9,800 cal/g = -410 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COPPER NAPHTHENATE

CNN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	61.800	52	0.480	52	1.048	77	0.990
54	61.800	54	0.480	54	1.048		
56	61.800	56	0.480	56	1.048		
58	61.800	58	0.480	58	1.048		
60	61.800	60	0.480	60	1.048		
62	61.800	62	0.480	62	1.048		
64	61.800	64	0.480	64	1.048		
66	61.800	66	0.480	66	1.048		
68	61.800	68	0.480	68	1.048		
70	61.800	70	0.480	70	1.048		
72	61.800	72	0.480	72	1.048		
74	61.800	74	0.480	74	1.048		
76	61.800	76	0.480	76	1.048		
78	61.800	78	0.480	78	1.048		
80	61.800	80	0.480	80	1.048		
82	61.800	82	0.480	82	1.048		
84	61.800	84	0.480	84	1.048		
86	61.800	86	0.480	86	1.048		
88	61.800	88	0.480	88	1.048		
90	61.800	90	0.480	90	1.048		
92	61.800	92	0.480	92	1.048		
94	61.800	94	0.480	94	1.048		
96	61.800	96	0.480	96	1.048		
98	61.800	98	0.480	98	1.048		
100	61.800	100	0.480	100	1.048		
102	61.800	102	0.480	102	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		90	0.093		N O T  P E R T I N E N T		N O T  P E R T I N E N T
		100	0.123				
		110	0.161				
		120	0.210				
		130	0.270				
		140	0.345				
		150	0.437				
		160	0.550				
		170	0.686				
		180	0.851				
		190	1.048				
		200	1.282				
		210	1.560				
		220	1.886				
		230	2.269				
		240	2.714				
		250	3.231				
		260	3.828				
		270	4.513				
		280	5.298				
		290	6.192				
		300	7.208				
		310	8.358				
		320	9.654				
		330	11.110				
		340	12.740				

# O-CHLORONITROBENZENE

CNO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Chloro-2-nitrobenzene o-Nitrochlorobenzene	Solid crystals Yellow Aromatic  Sinks in water.
Keep people away. AVOID CONTACT WITH SOLID AND DUST. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with water, foam, carbon dioxide or dry chemical.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose, and throat. If inhaled can cause headache, languor, cyanosis, shallow respiration, and coma. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. POISONOUS IF SWALLOWED OR SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: <chem>Oc1ccccc1Cl[N+](=O)[O-]</chem> 2.3 IMO/UN Designation: 6.1/1578 2.4 DOT ID No.: 1578 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: 152 2.7 Standard Industrial Trade Classification: 51489
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Rubber gloves, self-contained respirator, goggles, protective clothing, and safety shoes. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Headache, languor, anemia. Irritation of nose and throat, cyanosis, shallow respiration, convulsions, and coma. EYES: Irritation. SKIN: Irritation. INGESTION: Forms methemoglobin giving rise to cyanosis and blood changes. 3.3 <b>Treatment of Exposure:</b> Call a physician. INHALATION: Remove from exposure. If indicated give artificial respiration. EYES: Wash with water for at least 15 minutes. Get medical aid. SKIN: Wash with soap and running water. INGESTION: Give emetic, gastric lavage. Get medical aid. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; LD <sub>50</sub> = 50 to 500 mg/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Weight loss, anemia, weakness and irritability. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 261°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray, foam, carbon dioxide, dry chemical (Water or foam may cause frothing).  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Ignites at high temperatures with evolution of nitrogen oxide and chloride fumes.  
4.6 **Behavior in Fire:** Volatile solid which gives off flammable vapors when heated; may form explosive mixtures with air.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 32:1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 96-hour TL<sub>m</sub> Finfish, 100 to 1000 ppm.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Cool  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 1

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	1

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 157.56  
9.3 **Boiling Point at 1 atm:** 474.8°F = 246°C = 519.2°K  
9.4 **Freezing Point:** 90.5°F = 32.5°C = 363.7°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.368 at 22°C (solid)  
9.8 **Liquid Surface Tension:** 43.63 dynes/cm = 0.04363 N/m at 35°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 5.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# O-CHLORONITROBENZENE

CNO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
75 80 85 90 95 100 105	85.334 85.139 84.945 84.752 84.559 84.367 84.174		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	90	26.400

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470	0.689 1.874 2.972 3.991 4.940 5.825 6.653 7.430 8.160 8.846 9.494 10.105 10.683 11.231 11.751 12.245 12.715 13.162 13.589 13.996 14.385 14.757 15.114		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# CALCIUM NITRATE

CNT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Calcium nitrate tetrahydrate		Solid	White	Odorless
		Sinks and mixes with water.		
Call fire department. Keep people away. Avoid contact with solid. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Flood discharge area with water.			
<b>Exposure</b>	Call for medical aid. DUST Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.			
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: 5.1/1454
- 2.4 DOT ID No.: 1454
- 2.5 CAS Registry No.: 10124-37-5
- 2.6 NAERG Guide No.: 140
- 2.7 Standard Industrial Trade Classification: 52359

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust respirator and rubber gloves.
- 3.2 Symptoms Following Exposure: Dust causes mild irritation of eyes.
- 3.3 Treatment of Exposure: EYES or SKIN: flush with water and seek medical assistance.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: None
- 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable, but may cause fire on contact with combustibles.
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Flood with water.
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: May give off toxic oxides of nitrogen when involved in fire.
- 4.6 Behavior in Fire: Greatly intensifies the burning of all combustible materials.
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not Pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not Pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Contact with combustible material may cause fire.
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 10,000 ppm/96 hr/sunfish/TL<sub>50</sub>/fresh water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Analytical reagent (99.0+%); purified; technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Ambient
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer
- 8.2 49 CFR Class: 5.1
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 164
- 9.3 Boiling Point at 1 atm: Decomposes
- 9.4 Freezing Point: 1,042°F = 561°C = 834°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.50 at 18°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: (est.)-90 Btu/lb = -50 cal/g = -2.1 X 10<sup>5</sup> J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: 31.2 cal/g
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# CALCIUM NITRATE

CNT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	280.500		N		N		N
36	295.099		O		O		O
38	309.599		T		T		T
40	324.199						
42	338.799		P		P		P
44	353.299		E		E		E
46	367.899		R		R		R
48	382.399		T		T		T
50	397.000		I		I		I
52	411.500		N		N		N
54	426.099		E		E		E
56	440.599		N		N		N
58	455.199		E		E		E
60	469.799		N		N		N
62	484.299		T		T		T
64	498.899						
66	513.399						
68	528.000						
70	542.500						
72	557.099						
74	571.599						
76	586.199						
78	600.799						
80	615.299						
82	629.899						
84	644.399						

# COBALT BROMIDE (OUS)

COB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cobalt (II) bromide Cobalt dibromide Cobaltous bromide	Solid crystals      Reddish violet      Slight  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS FUMES ARE PRODUCED WHEN HEATED TO DECOMPOSITION.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. Harmful if swallowed. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CoBr}_2$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 7789-43-7
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Prevent contact, use rubber gloves, protective clothing, barrier creams, chemical dust mask, and safety goggles.
- 3.2 **Symptoms Following Exposure:** INHALATION: Bromine rash (resembling acne) may occur especially on face. EYES: Irritation. SKIN: May produce dermatitis. INGESTION: Depression, emaciation, gastroenteric distress, constipation, skin rash. In severe cases psychoses and mental deterioration.
- 3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Move to fresh air. EYES: Wash with water then irrigate with 0.9% saline for at least 15 minutes. SKIN: Wash with water. INGESTION: Induce vomiting by use of salt water. Caffeine and sodium benzoate may be of value for respiratory failure. Call physician.
- 3.4 **TLV-TWA:** 0.02  $\text{mg}/\text{m}^3$  as Co
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Inorganic bromides can cause depression, emaciation, and in severe cases, psychoses and mental deterioration. An acne-like rash often occurs.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 20  $\text{mg}/\text{m}^3$  as cobalt
- 3.14 **OSHA PEL-TWA:** 0.1  $\text{mg}/\text{m}^3$  as cobalt
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** When heated to decomposition can give off highly toxic fumes of Br.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Will not occur
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
10  $\text{mg}/\text{l}$  of cobalt ion is lethal concentration for sticklebacks.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Microorganisms concentrate Co in water up to 1,000 to 1,500 times.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Cool
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 218.77
- 9.3 **Boiling Point at 1 atm:** Loses 4  $\text{H}_2\text{O}$  at 100°C and all  $\text{H}_2\text{O}$  at 130°C
- 9.4 **Freezing Point:** Anhydrate: 1252.4°F = 678°C = 951.2°K Hexahydrate: 117.5°F = 47.5°C = 320.7°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 4.909 at 25°C 2.46 at room temperature (hexahydrate)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** For anhydrous  $\text{CoBr}_2$  (exothermic) -151 Btu/lb = -84.1 cal/g =  $-3.5 \times 10^5$  J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COBALT BROMIDE (OUS)

COB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
40	99.238		N		N		C
50	108.410		O		O		U
60	117.582		T		T		R
70	126.754						R
80	135.926		P		P		E
90	145.098		E		E		N
100	154.271		R		R		T
110	163.442		T		T		L
120	172.615		I				
130	181.787		N				N
140	190.959		E				O
150	200.132		N				T
160	209.303		T				
170	218.476						A
180	227.648						V
190	236.820						A
200	245.992						I
210	255.165						L
							A
							B
							L
							E

# COBALT FLUORIDE

COF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cobalt difluoride Cobalt (II) fluoride	Solid  Violet to red  Sinks and mixes slowly with water.
Wear goggles, self-contained breathing apparatus, rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be harmful if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CoF}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses, polyvinyl chloride gloves, filter respirator (dust, fume, mist), chemical apron.  
3.2 **Symptoms Following Exposure:** INHALATION: Inhalation of dust may cause pulmonary symptoms. EYES: Irritation. SKIN: Skin rashes, dermatitis. INGESTION: Nausea and vomiting caused by local irritation.  
3.3 **Treatment of Exposure:** Call a doctor. EYES: Flush with plenty of water for at least 15 minutes. SKIN: Flush with soap and water. INGESTION: Induce vomiting. Get medical attention.  
3.4 **TLV-TWA:** 0.02 mg/m<sup>3</sup> as cobalt  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Loss of weight, anorexia, anemia, wasting and cachexia, and dental effects are common in chronic fluoride poisoning.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 20 mg/m<sup>3</sup> as cobalt  
3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as cobalt  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** None  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Currently not available  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 10 mg is lethal concentration for sticklebacks. For the fluoride ion, the TL<sub>m</sub> for trout is from 2.3 to 7.5 mg/l depending on temperature. The mosquito fish TL<sub>m</sub> 96 hour is 419 mg/l.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Organisms can concentrate cobalt 1070 to 1500 times.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 96.94  
9.3 **Boiling Point at 1 atm:** Volatilizes at about 1400°C  
9.4 **Freezing Point:** 2192°F = 1200°C = 1473.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 4.46 at 25°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** For anhydrous  $\text{CoF}_2$  (exothermic) -271 Btu/lb = -150.6 cal/g = -6.3 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 92.9 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

COBALT FLUORIDE

COF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	1.500		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# COPPER OXALATE

COL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cupric oxalate hemihydrate	Solid	Bluish white	Odorless
Sinks in water.			
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:**  $\text{CuC}_2\text{O}_4 \cdot 1/2\text{H}_2\text{O}$
- 2.3 **IMO/UN Designation:** Not listed
- 2.4 **DOT ID No.:** Not listed
- 2.5 **CAS Registry No.:** 5893-66-3
- 2.6 **NAERG Guide No.:** Not listed
- 2.7 **Standard Industrial Trade Classification:** 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion of very large amounts may produce symptoms of oxalate poisoning; watch for edema of the glottis and delayed constriction of esophagus. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; if exposure has been prolonged, watch for symptoms of oxalate poisoning (nausea, shock, collapse, and convulsions). INGESTION: give large amount of water; induce vomiting; get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water.
- 3.4 **TLV-TWA:** Notice of intended change: 0.05 mg Cu/m<sup>3</sup> respirable particles
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 100 mg Cu/m<sup>3</sup> (dusts, mists, fumes)
- 3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as copper
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic carbon monoxide gas may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Copper known to be accumulated by shellfish. Hazard to humans unknown.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 160.6
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** >1 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# COPPER OXALATE

COL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.002		N		N		N
36	0.002		O		O		O
38	0.002		T		T		T
40	0.002						
42	0.002		P		P		P
44	0.002		E		E		E
46	0.002		R		R		R
48	0.002		T		T		T
50	0.002		I		I		I
52	0.002		N		N		N
54	0.002		E		E		E
56	0.002		N		N		N
58	0.002		E		E		E
60	0.002		N		N		N
62	0.002		T		T		T
64	0.002						
66	0.002						
68	0.002						
70	0.002						
72	0.002						
74	0.002						
76	0.002						
78	0.002						
80	0.002						
82	0.002						
84	0.002						

# COPPER ACETATE

COP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, cupric salt Crystallized verdigris Cupric acetate monohydrate Neutral verdigris	Solid  Bluish-green  Odorless  Mixes with water.
<b>Keep people away.</b> <b>Avoid contact with solid and dust.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable. Irritating gases may be produced when heated.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn eyes. Irritating to eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot \text{H}_2\text{O}$
- 2.3 IMO/IUN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 142-71-2
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51371

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves
- 3.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of throat and lungs. Ingestion of large amounts causes violent vomiting and purging, intense pain, collapse, coma, convulsions, and paralysis. Contact with solutions irritates eyes; contact with solid causes severe eye surface injury and irritation of skin.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water; induce vomiting; get medical attention. EYES: flush with water for at least 15 min.; get medical attention if injury was caused by solid. SKIN: flush with water.
- 3.4 **TLV-TWA:** Notice of intended change: 0.05 mg Cu/m<sup>3</sup> respirable particles
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes degeneration of liver in dogs
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 100 mg Cu/m<sup>3</sup> (dusts, mists, fumes)
- 3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as copper
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
**Products:** Irritating vapors of acetic acid may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Copper known to be accumulated by shellfish. Hazard to humans unknown.
- 6.5 **GESAMP Hazard Profile:**  
**Bioaccumulation:** 0  
**Damage to living resources:** 1  
**Human Oral hazard:** 1  
**Human Contact hazard:** II  
**Reduction of amenities:** XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 95-99%; Reagent, 99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 199.65
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 239°F = 115°C = 388°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.9 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COPPER ACETATE

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	2.288		N		N		N
36	2.577		O		O		O
38	2.866		T		T		T
40	3.155						
42	3.444		P		P		P
44	3.733		E		E		E
46	4.022		R		R		R
48	4.310		T		T		T
50	4.599		I		I		I
52	4.888		N		N		N
54	5.177		E		E		E
56	5.466		N		N		N
58	5.755		T		T		T
60	6.044						
62	6.333						
64	6.622						
66	6.910						
68	7.199						
70	7.488						
72	7.777						
74	8.066						
76	8.355						
78	8.644						
80	8.933						
82	9.222						
84	9.510						

# COBALT SULFAMATE

COS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cobalt amino sulfonate Cobaltous sulfamate Sulfamic acid, cobalt salt	Solid  Red  Odorless  Sinks and mixes with water.
<b>Keep people away.</b> <b>Avoid contact with solid and dust.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable Will increase the intensity of a fire. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled, will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed, will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CoS}_2\text{O}_6\text{N}_2\text{H}_4$
- 2.3 IMO/UN Designation: Not Listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 16107-41-3
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, rubber gloves, safety goggles, protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes shortness of breath and coughing; permanent disability may occur. Ingestion causes pain and vomiting. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: Move to fresh air; if breathing has stopped, begin artificial respiration and call a doctor. INGESTION: Give large amount of water; induce vomiting; call a doctor. EYES: Flush with water for at least 15 minutes. SKIN: Flush with water.
- 3.4 **TLV-TWA:** 0.02 mg/m<sup>3</sup> (as Cobalt)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> about 400 mg/kg (rabbit) (as Cobalt)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes malignant tumors in rabbits
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 20 mg/m<sup>3</sup> as Cobalt
- 3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as cobalt
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.
- 4.6 **Behavior in Fire:** May increase the intensity of a fire.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Contact with wood or paper may cause fire.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
10 ppm\*/stickleback/lethal conc. limit/fresh water  
15 ppm\*/68 hr./stickleback avg. survival time/fresh water  
20 ppm\*/96 hr./stickleback/avg. survival time/fresh water  
\*as cobalt
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Bioconcentration of 200-1000 fold only under constant exposure. Not significant under spill conditions.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical trihydrate. May be shipped as anhydrous solid.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not Pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 253.13
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** Currently not available
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COBALT SULFAMATE

COS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# COUMAPHOS

COU

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Co-ral O,O-Diethyl-O-(3-chloro-4-methyl-2-oxo-(2h)-1-benzopyran-7-yl) phosphorothioate	Solid                      White                      Weak sulfurous odor  Solid sinks in water.
Call fire department. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with water, foam, carbon dioxide or dry chemical.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR DUST Irritating to skin and eyes. Harmful if swallowed or inhaled. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. If inhaled, move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula: C<sub>14</sub>H<sub>16</sub>ClO<sub>2</sub>PS  
 2.3 IMO/UN Designation: 6.1/2783  
 2.4 DOT ID No.: 2783  
 2.5 CAS Registry No.: 56-72-4  
 2.6 NAERG Guide No.: 152  
 2.7 Standard Industrial Trade Classification: 51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor respirator; rubber gloves; goggles  
 3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes sense of tightness in chest, sweating, contracted pupils of eyes, stomach pains, vomiting, and diarrhea. Pulmonary edema may develop as long as 12 hours after acute exposures. Contact with eyes causes irritation; overexposure may cause same symptoms as inhalation. Irritates skin.  
 3.3 **Treatment of Exposure:** Get medical attention after all overexposure to this substance. Atropine sulfate and 2-PAM are antidotes. INHALATION: remove to fresh air; support respiration; keep patient quiet until medical help arrives; observe for development of pulmonary edema, even after 12 hours. INGESTION: induce vomiting; give water and again induce vomiting; give aqueous slurry of medicinal charcoal. EYES: flush with water for at least 15 min. SKIN: wash with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 4; oral LD<sub>50</sub> = 16 mg/kg (rat)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** 0.02 ppm  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
 Not pertinent (combustible solid)  
 4.2 **Flammable Limits in Air:** Not pertinent  
 4.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide, dry chemical  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Toxic and irritating oxides of sulfur and phosphorus may form in fires.  
 4.6 **Behavior in Fire:** Currently not available  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** Not pertinent  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** Currently not available  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 0.18 ppm/96 hr/bluegill/TL<sub>m</sub>/fresh water  
 0.11 ppm/48 hr/oyster larvae/TL<sub>m</sub>/salt water  
 6.2 **Waterfowl Toxicity:** 21.5 to 41.5 mg/kg LD<sub>50</sub>  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 5-50% active ingredient, the balance being inert solids  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
 8.2 **49 CFR Class:** 6.1  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** Yes  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** 10 pounds  
 8.7 **EPA Pollution Category:** A  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
 9.2 **Molecular Weight:** 362.5  
 9.3 **Boiling Point at 1 atm:** Not pertinent  
 9.4 **Freezing Point:** 199°F = 93°C = 366°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 1.474 at 20°C (solid)  
 9.8 **Liquid Surface Tension:** Not pertinent  
 9.9 **Liquid Water Interfacial Tension:** Not pertinent  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** Not pertinent  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COUMAPHOS

COU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CADMIUM OXIDE

COX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cadmium fume	Solid  Yellow-brown  Odorless  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear a dust respirator. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. If inhaled will cause coughing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CdO  
2.3 IMO/IUN Designation: Not listed  
2.4 DOT ID No.: 2570  
2.5 CAS Registry No.: 1306-19-0  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Bu. Mines approved respirator; goggles; rubber gloves
- 3.2 **Symptoms Following Exposure:** A single exposure to cadmium oxide fumes can cause severe or fatal lung irritation; chronic poisoning is characterized by lung injury (emphysema) and kidney dysfunction. Ingestion produces severe toxic effects; both kidney and liver injuries may occur. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: if there has been known exposure to dense cadmium oxide fume or if cough, chest tightness, or respiratory distress occur after possible exposure, place patient at bed rest and call a physician. INGESTION: induce vomiting; stop irritation by giving milk or egg whites at frequent intervals; perform gastric lavage; seek medical attention. EYES: flush with water for at least 15 min.
- 3.4 **TLV-TWA:** 0.01 mg Cd/m<sup>3</sup> inhalable; 0.002 mg Cd/m<sup>3</sup> respirable fraction.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral rat LD<sub>50</sub> = 72 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Delayed liver, lung, and kidney damage has followed respiratory exposures to cadmium salts in industry.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 9 mg/m<sup>3</sup> as Cd
- 3.14 **OSHA PEL-TWA:** 0.005 mg/m<sup>3</sup> as Cd
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic cadmium oxide fume may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Concentrated by shellfish
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent; technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 128.4
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 6.95 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# CADMIUM OXIDE

COX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

# COPPER ARSENITE

CPA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Copper orthoarsenite Cupric arsenite Cupric green Scheele's green Swedish green	Solid  Green  Odorless   Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST. Stay upwind. Use water spray to "knock down" dust. Wear goggles and dust respirator. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CuHAsO}_3$
- 2.3 IMO/UN Designation: 6.1/1586
- 2.4 DOT ID No.: 1586
- 2.5 CAS Registry No.: 1302-97-2
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 52499

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; rubber gloves; goggles or face shield.
- 3.2 **Symptoms Following Exposure:** Dust irritates eyes. Ingestion causes gastric disturbance, tremors, muscular cramps, and nervous collapse that may cause death.
- 3.3 **Treatment of Exposure:** Following ingestion or unusually severe exposure to dust, get medical attention. Alert doctor to possibility of arsenic poisoning. EYES: flush with water for 15 min. SKIN: wash with soap and water. INGESTION: give large amounts of water; induce vomiting; give cathartic, such as 2 oz. of Epsom salt in water.
- 3.4 **TLV-TWA:** Notice of intended change: 0.05 mg Cu/m<sup>3</sup> respirable particles
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Arsenic poisoning
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 100 mg Cu/m<sup>3</sup> (dusts, mists, fumes)
- 3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as copper
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
Products: Poisonous, volatile arsenic oxides may be formed in fires.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 3  
Human Oral hazard: 3  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 277.4
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** (est.) > 1.1 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

COPPER ARSENITE

CPA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT PERTINENT		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	INSOLUBLE		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

# COPPER BROMIDE

CPB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cupric bromide, anhydrous	Solid Black Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Irritating gases may be produced when heated. Cover with organic sulfur.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn eyes. Irritating to skin. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CuBr}_2$   
2.3 IMO/IUN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves  
3.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of throat and lungs. Ingestion of large amounts causes violent vomiting and purging, intense pain, collapse, coma, convulsions, and paralysis. Contact with solutions causes eye irritation; contact with solid causes severe eye surface injury and skin irritation.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water; induce vomiting; get medical attention. EYES: flush with water for at least 15 min.; get medical attention if injury was caused by solid. SKIN: flush with water.  
3.4 **TLV-TWA:** Notice of intended change: 0.05 mg  $\text{Cu}/\text{m}^3$  respirable particles  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50} = 50\text{-}500 \text{ mg/kg}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 100 mg  $\text{Cu}/\text{m}^3$  (dusts, mists, fumes)  
3.14 **OSHA PEL-TWA:** 0.1 mg/ $\text{m}^3$  as copper  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating hydrogen bromide gas may form in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:**  
Copper known to be accumulated by shellfish. Hazard to humans unknown.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure, 99%, Reagent  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 223.35  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** 928°F = 498°C = 771°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 4.77 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -70.9 Btu/lb = -39.4 cal/g = -1.65 X 10<sup>4</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COPPER BROMIDE

CPB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	55.900		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# COPPER CHLORIDE

CPC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cupric chloride dihydrate Eriochoicite (anhydrous)	Solid	Blue-green	Odorless
Sinks and mixes with water.			
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn eyes. Irritating to eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
 2.2 Formula:  $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$   
 2.3 IMO/UN Designation: Not listed  
 2.4 DOT ID No.: 2802  
 2.5 CAS Registry No.: 7447-39-4  
 2.6 NAERG Guide No.: 154  
 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Bu. Mines approved respirator; rubber gloves; safety goggles  
 3.2 Symptoms Following Exposure: Inhalation causes coughing and sneezing. Ingestion causes pain and vomiting. Contact with solutions irritates eyes; contact with solid causes severe eye surface injury and skin irritation.  
 3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: give large amounts of water; induce vomiting; get medical attention. EYES: flush with water for 15 min.; consult a doctor if injury was caused by solid. SKIN: flush with water.  
 3.4 TLV-TWA: Notice of intended change: 0.05 mg  $\text{Cu}/\text{m}^3$  respirable particles  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 Toxicity by Ingestion: Grade 3;  $\text{LD}_{50} = 50\text{-}500 \text{ mg/kg}$   
 3.8 Toxicity by Inhalation: Currently not available.  
 3.9 Chronic Toxicity: Causes liver damage in rabbits  
 3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
 3.11 Liquid or Solid Characteristics: Currently not available  
 3.12 Odor Threshold: Currently not available  
 3.13 IDLH Value: 100 mg  $\text{Cu}/\text{m}^3$  (dusts, mists, fumes)  
 3.14 OSHA PEL-TWA: 0.1 mg/ $\text{m}^3$  as copper  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
 4.2 Flammable Limits in Air: Not flammable  
 4.3 Fire Extinguishing Agents: Not pertinent  
 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
 4.5 Special Hazards of Combustion  
 Products: Irritating hydrogen chloride gas may form in fire.  
 4.6 Behavior in Fire: Currently not available  
 4.7 Auto Ignition Temperature: Not pertinent  
 4.8 Electrical Hazards: Not pertinent  
 4.9 Burning Rate: Not pertinent  
 4.10 Adiabatic Flame Temperature: Currently not available  
 4.11 Stoichiometric Air to Fuel Ratio: Not Pertinent  
 4.12 Flame Temperature: Currently not available  
 4.13 Combustion Molar Ratio (Reactant to Product): Not Pertinent  
 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.  
 5.2 Reactivity with Common Materials: In presence of moisture may corrode metals; the reaction is not hazardous.  
 5.3 Stability During Transport: Stable  
 5.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash.  
 5.5 Polymerization: Not pertinent  
 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
 0.009 ppm (as Cu)/goldfish/rapid death/fresh water  
 0.1-0.5 ppm/oyster/toxic/salt water  
 0.55 ppm/12 hr/mussel/killed/salt water  
 \*Time period not specified.  
 6.2 Waterfowl Toxicity: Currently not available  
 6.3 Biological Oxygen Demand (BOD): None  
 6.4 Food Chain Concentration Potential: Copper known to be accumulated by shellfish. Hazard to humans unknown.  
 6.5 GESAMP Hazard Profile:  
 Bioaccumulation: +  
 Damage to living resources: 4  
 Human Oral hazard: 3  
 Human Contact hazard: 0  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent; C.P.; Technical  
 7.2 Storage Temperature: Ambient  
 7.3 Inert Atmosphere: No requirement  
 7.4 Venting: Open  
 7.5 IMO Pollution Category: Currently not available  
 7.6 Ship Type: Currently not available  
 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
 8.2 49 CFR Class: 8  
 8.3 49 CFR Package Group: III  
 8.4 Marine Pollutant: Yes  
 8.5 NFPA Hazard Classification: Not listed  
 8.6 EPA Reportable Quantity: 10 pounds  
 8.7 EPA Pollution Category: A  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
 9.2 Molecular Weight: 170.48 (dihydrate)  
 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
 9.4 Freezing Point: Not pertinent  
 9.5 Critical Temperature: Not pertinent  
 9.6 Critical Pressure: Not pertinent  
 9.7 Specific Gravity: 2.54 at 20°C (solid)  
 9.8 Liquid Surface Tension: Not pertinent  
 9.9 Liquid Water Interfacial Tension: Not pertinent  
 9.10 Vapor (Gas) Specific Gravity: Not pertinent  
 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
 9.12 Latent Heat of Vaporization: Not pertinent  
 9.13 Heat of Combustion: Not pertinent  
 9.14 Heat of Decomposition: Not pertinent  
 9.15 Heat of Solution: Not pertinent  
 9.16 Heat of Polymerization: Not pertinent  
 9.17 Heat of Fusion: 24.7 cal/g  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# COPPER CHLORIDE

CPC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	70.950		N		N		N
36	71.309		O		O		O
38	71.669		T		T		T
40	72.020						
42	72.379		P		P		P
44	72.730		E		E		E
46	73.089		R		R		R
48	73.440		T		T		T
50	73.799		I		I		I
52	74.150		N		N		N
54	74.509		E		E		E
56	74.870		N		N		N
58	75.219		E		E		E
60	75.580		N		N		N
62	75.929		T		T		T
64	76.290						
66	76.639						
68	77.000						
70	77.349						
72	77.709						
74	78.070						
76	78.419						
78	78.780						
80	79.129						
82	79.490						
84	79.839						

# CYCLOPENTENE

CPE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> UN 2246 (DOT)		Liquid	Colorless
<b>Keep people away.</b> Shut off ignition sources and call fire department. Evacuate area. Avoid contact with liquid and vapor. Wear self-contained breathing apparatus and protective clothing. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective on fire. Extinguish with dry chemical, foam, or carbon dioxide. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Dilute and disperse Contain Collection Systems: Skim Chemical and Physical Treatment: Burn Clean shoreline Salvage waterfowl	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 30; Olefins 2.2 Formula: C <sub>5</sub> H <sub>8</sub> 2.3 IMO/UN Designation: 3.1/2246 2.4 DOT ID No.: 2246 2.5 CAS Registry No.: 142-29-0 2.6 NAERG Guide No.: 128 2.7 Standard Industrial Trade Classification: 51129
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus and protective clothing. 3.2 <b>Symptoms Following Exposure:</b> May be harmful by inhalation, ingestion, or skin absorption. May cause eye and skin irritation. 3.3 <b>Treatment of Exposure:</b> INHALATION: Call a physician. If inhaled, remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Separate eyelids with finger. Flush with copious amounts of water for at least 15 minutes. SKIN: Flush with water. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 1.656 g/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
-30°F C.C.
- 4.2 **Flammable Limits in Air:** LEL 1.5%, upper explosive limit data not available.
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Vapor may travel considerable distance to a source of ignition and flashback. Explosion may occur under fire condition.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** No reaction.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (3)  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Refrigerate
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** (B)
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable Liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 68.12
- 9.3 **Boiling Point at 1 atm:** 112°F = 44°C = 317.2°K
- 9.4 **Freezing Point:** -211°F = -135°C = 138.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.774
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 2.35
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# CYCLOPENTENE

CPE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.199 0.214 0.228 0.243 0.256 0.270 0.283 0.297 0.309 0.322 0.334 0.346 0.358 0.369 0.381 0.392 0.402 0.413 0.423 0.433 0.443 0.453 0.462 0.471 0.480

# COPPER FLUOROBORATE

CPF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Copper borofluoride solution Copper(II) fluoroborate solution Cupric fluoroborate solution	Liquid  Dark blue  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Irritating gases may be produced when heated.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Cu}(\text{BF}_4)_2 \cdot \text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber apron and gloves
- 3.2 Symptoms Following Exposure: Inhalation of mist irritates nose and throat. Ingestion causes pain and vomiting. Contact causes severe irritation of eyes and irritation of skin.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: give large amounts of water and induce vomiting if required. EYES: flush with water for at least 15 min.; get medical attention if irritation persists. SKIN: flush with water.
- 3.4 TLV-TWA: Notice of intended change: 0.05 mg  $\text{Cu}/\text{m}^3$  respirable particles
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 3;  $\text{LD}_{50} = 50\text{-}500 \text{ mg/kg}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: 100 mg  $\text{Cu}/\text{m}^3$  (dusts, mists, fumes)
- 3.14 OSHA PEL-TWA: 0.1 mg/ $\text{m}^3$  as copper
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEG1: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Irritating hydrogen fluoride gas may form in fires.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not Pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not Pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: May corrode some metals.
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash.
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: Copper known to be accumulated by shellfish. Hazard to humans unknown.
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical C.P. 45-50% solutions in water
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 237.16 (solute only)
- 9.3 Boiling Point at 1 atm: (approx.) 212°F = 100°C = 373°K
- 9.4 Freezing Point: Currently not available
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.54 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# COPPER FLUOROBORATE

CPF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	96.129		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# COPPER GLYCINATE

CPG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cupric amino acetate Bis(glycinato) copper Glycine copper complex Glycocol-copper	Solid  Blue  Mixes in water.
Protect water intakes. Notify local health and pollution control agencies.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Harmful if swallowed. Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:**  $\text{Cu}(\text{H}_2\text{NCH}_2\text{COO})_2$   
 $\text{Cu}(\text{H}_2\text{NCH}_2\text{COO})_2 \cdot \text{H}_2\text{O}$  Hydrate  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Currently not available  
3.2 **Symptoms Following Exposure:** INHALATION: Inhalation of dust may cause nasal congestion. EYES: Conjunctivitis and edema of eyelids. SKIN: Irritation. INGESTION: Vomiting caused by local irritant and astringent action of ionic copper on stomach and bowel.  
3.3 **Treatment of Exposure:** Call a physician. EYES: Wash with water. SKIN: Wash with water. INGESTION: Induce vomiting.  
3.4 **TLV-TWA:** Notice of intended change: 0.05 mg Cu/m<sup>3</sup> respirable particles  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Copper poisoning in animals leads to injury of the liver, kidneys, and spleen.  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Not pertinent  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 100 mg Cu/m<sup>3</sup> (dusts, mists, fumes)  
3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as copper  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Currently not available  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not Pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not Pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Currently not available  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Currently not available  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 211.66; 229.67 monohydrate; 247.69 dihydrate  
9.3 **Boiling Point at 1 atm:** Decomposes with gas evolution.  
9.4 **Freezing Point:** Monohydrate - H<sub>2</sub>O at 123°C  
Chars at 213°C Decomposes at 228°C  
Dihydrate - H<sub>2</sub>O at 103°C -2H<sub>2</sub>O at 140°C  
Decomposes at 225°C  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COPPER GLYCINATE

CPG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
0	59.000		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# CAMPHENE

CPH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,2-Dimethyl-3-methylene norborane 3,3-Dimethyl-2-methylene norcamphane	Solid                      White                      Camphor-like odor  Floats on water.
Keep people away. Avoid inhalation. Shut off ignition sources and call fire department. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause headache or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula:  $C_{10}H_{16}$   
 2.3 IMO/UN Designation: Not listed  
 2.4 DOT ID No.: 9011  
 2.5 CAS Registry No.: 79-92-5  
 2.6 NAERG Guide No.: 133  
 2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Gloves and face shield  
 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with eyes or skin causes irritation.  
 3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air; call physician immediately. EYES: flush immediately with clean, cool water; call physician immediately. SKIN: wash with alcohol, follow with soap and water wash.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 108°F O.C. 92°F C.C. (typical)  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water  
 4.5 **Special Hazards of Combustion Products:** Currently not available  
 4.6 **Behavior in Fire:** Currently not available  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Not pertinent  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 66.6 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** Currently not available  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial, 75+%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed.  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
 9.2 **Molecular Weight:** 136  
 9.3 **Boiling Point at 1 atm:** 310°F = 154°C = 427°K  
 9.4 **Freezing Point:** 122°F = 50°C = 323°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.87 at 15°C (solid)  
 9.8 **Liquid Surface Tension:** Not pertinent  
 9.9 **Liquid Water Interfacial Tension:** Not pertinent  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** -19,400 Btu/lb = -10,800 cal/g = -452 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CAMPHENE

CPH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305	1.039 1.174 1.322 1.487 1.670 1.872 2.095 2.340 2.610 2.906 3.231 3.586 3.975 4.399 4.862 5.366 5.914 6.510 7.156 7.855 8.613 9.432 10.320 11.270 12.300 13.400	180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305	0.02059 0.02306 0.02579 0.02879 0.03208 0.03568 0.03963 0.04394 0.04865 0.05377 0.05935 0.06540 0.07198 0.07910 0.08680 0.09513 0.10410 0.11380 0.12420 0.13550 0.14750 0.16050 0.17430 0.18920 0.20510 0.22210		N O T  P E R T I N E N T

# CHLOROPICRIN

CPL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nitrochloroform Nitrotrichloromethane Picfume Trichloronitromethane	Oily liquid  Colorless  Extremely irritating odor  Sinks in water. Poisonous vapor is produced.
<b>Evacuate.</b> <b>KEEP PEOPLE AWAY.</b> <b>Avoid inhalation.</b> <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Wear chemical protective suit with self-contained breathing apparatus. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Cl}_2\text{CNO}_2$
- 2.3 IMO/UN Designation: 6.1/1580
- 2.4 DOT ID No.: 1580
- 2.5 CAS Registry No.: 76-06-2
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self contained breathing apparatus, rubber gloves, protective clothing
- 3.2 **Symptoms Following Exposure:** Inhalation causes nausea, eye watering, vomiting, bronchitis, and pulmonary edema. Vapor is a powerful tear gas. Liquid irritates and burns skin and causes severe burns of eyes. Ingestion causes severe irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove from exposure; support respiration. EYES: flush with copious quantities of water for at least 15 min. SKIN: wash with water for 15 min. INGESTION: do NOT induce vomiting; give large amounts of water.
- 3.4 **TLV-TWA:** 0.1 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral  $\text{LD}_{50}$  = 250 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** 1.1 ppm
- 3.13 **IDLH Value:** 2 ppm
- 3.14 **OSHA PEL-TWA:** 0.1 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Cool exposed containers with water.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Compound forms a powerful tear gas when heated. Heated material may detonate under fire conditions.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (3)  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	0
Instability (Yellow).....	3
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 164.4
- 9.3 **Boiling Point at 1 atm:** 234°F = 112°C = 385°K
- 9.4 **Freezing Point:** -83°F = -64°C = 209°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.64 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** 32.3 dynes/cm = 0.0323 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** 5.7
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0991
- 9.12 **Latent Heat of Vaporization:** 103 Btu/lb = 57.3 cal/g = 2.4 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 48.16 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# CHLOROPICRIN

CPL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	105.400	51	0.400	51	1.048	55	1.214
36	105.200	52	0.400	52	1.048	60	1.166
38	105.099	53	0.400	53	1.048	65	1.121
40	104.900	54	0.400	54	1.048	70	1.078
42	104.799	55	0.400	55	1.048	75	1.038
44	104.700	56	0.400	56	1.048	80	0.999
46	104.500	57	0.400	57	1.048	85	0.963
48	104.400	58	0.400	58	1.048	90	0.929
50	104.200	59	0.400	59	1.048	95	0.897
52	104.099	60	0.400	60	1.048	100	0.866
54	104.000	61	0.400	61	1.048	105	0.837
56	103.799	62	0.400	62	1.048	110	0.809
58	103.700	63	0.400	63	1.048	115	0.783
60	103.599	64	0.400	64	1.048	120	0.758
62	103.400	65	0.400	65	1.048	125	0.734
64	103.299	66	0.400	66	1.048	130	0.712
66	103.099	67	0.400	67	1.048	135	0.690
68	103.000	68	0.400	68	1.048	140	0.670
70	102.900	69	0.400	69	1.048	145	0.650
72	102.700	70	0.400	70	1.048	150	0.631
74	102.599	71	0.400	71	1.048	155	0.613
76	102.400	72	0.400	72	1.048	160	0.596
78	102.299	73	0.400	73	1.048	165	0.580
80	102.200	74	0.400	74	1.048	170	0.564
82	102.000	75	0.400	75	1.048	175	0.549
84	101.900	76	0.400	76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.224	0	0.035	0	0.00115	0	0.123
36	0.221	10	0.051	10	0.00165	20	0.127
38	0.218	20	0.073	20	0.00233	40	0.130
40	0.215	30	0.104	30	0.00325	60	0.133
42	0.213	40	0.146	40	0.00446	80	0.136
44	0.210	50	0.201	50	0.00605	100	0.139
46	0.207	60	0.275	60	0.00811	120	0.141
48	0.204	70	0.371	70	0.01073	140	0.144
50	0.201	80	0.496	80	0.01406	160	0.147
52	0.198	90	0.655	90	0.01824	180	0.149
54	0.195	100	0.856	100	0.02343	200	0.152
56	0.192	110	1.109	110	0.02982	220	0.155
58	0.189	120	1.424	120	0.03763	240	0.157
60	0.187	130	1.813	130	0.04709	260	0.159
62	0.184	140	2.290	140	0.05849	280	0.162
64	0.181	150	2.870	150	0.07210	300	0.164
66	0.178	160	3.571	160	0.08826	320	0.166
68	0.175	170	4.413	170	0.10730	340	0.168
70	0.172	180	5.416	180	0.12970	360	0.170
72	0.169	190	6.607	190	0.15570	380	0.172
74	0.166	200	8.010	200	0.18600	400	0.174
76	0.163	210	9.656	210	0.22080	420	0.176
78	0.161	220	11.580	220	0.26080	440	0.178
80	0.158	230	13.800	230	0.30650		
82	0.155	240	16.380	240	0.35850		
84	0.152						

# P-CHLOROPHENOL

CPN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 4-Chlorophenol	Solid  White to straw  Medicinal odor  Sinks in water.
<b>Fire</b>  Keep people away. Avoid contact with solid and dust. Avoid inhalation. Wear rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies.  Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Irritating gases may be produced when heated. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide.	
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause headache or dizziness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 1, 4-ClC<sub>6</sub>H<sub>4</sub>OH  
2.3 IMO/UN Designation: 6.1/2020  
2.4 DOT ID No.: 2020  
2.5 CAS Registry No.: 106-48-9  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51244

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; face shield; boots and apron; respiratory protection  
3.2 **Symptoms Following Exposure:** Inhalation causes headache, dizziness, weak pulse. Ingestion causes irritation of mouth and stomach; headache, dizziness, weak pulse. Contact with eyes causes severe irritation and burning. Contact with skin causes irritation and burn; if absorbed, causes same symptoms as inhalation.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air; get medical attention if any symptoms develop. INGESTION: do not induce vomiting unless advised by a physician; give large amounts of milk, egg whites, or water and get medical help immediately; no specific antidote known. EYES: immediately flush with plenty of water for at least 30 min. SKIN: flush in safety shower while removing all contaminated clothing; wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 500 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** 30 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 250°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent (combustible solid)  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen chloride and chlorine gases may form in fires.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.7 ppm/96 hr/crab/lethal-range/sea water  
0.4 ppm/96 hr/crab/safe range/sea water  
14 ppm/24 hr/minnow/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure, 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 128.6  
9.3 **Boiling Point at 1 atm:** 428°F = 220°C = 493°K  
9.4 **Freezing Point:** 109°F = 43°C = 316°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.31 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 160 Btu/lb = 89 cal/g = 3.7 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -9,330 Btu/lb = -5,180 cal/g = -217 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# P-CHLOROPHENOL

CPN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	3.200	376 378 380 382 384 386 388 390 392 394 396 398 400 402 404 406 408 410 412 414 416 418 420 422 424 426	6.963 7.178 7.399 7.625 7.858 8.096 8.341 8.591 8.848 9.111 9.381 9.657 9.941 10.230 10.530 10.830 11.140 11.460 11.790 12.130 12.470 12.820 13.180 13.540 13.920 14.310	376 378 380 382 384 386 388 390 392 394 396 398 400 402 404 406 408 410 412 414 416 418 420 422 424 426	0.09982 0.10270 0.10560 0.10850 0.11160 0.11470 0.11790 0.12110 0.12450 0.12790 0.13130 0.13490 0.13850 0.14220 0.14600 0.14990 0.15390 0.15790 0.16210 0.16630 0.17060 0.17500 0.17950 0.18400 0.18870 0.19350		N O T  P E R T I N E N T

# CAMPHOR OIL

CPO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Liquid camphor Liquid gum camphor Liquid impure camphor	Oily liquid  Colorless or brown or blue  Penetrating camphor odor  Usually floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Not irritating to eyes, nose or throat. Move to fresh air.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 18; Ketone  
2.2 Formula:  $C_{10}H_{16}O$   
2.3 IMO/UN Designation: 3.3/1130  
2.4 DOT ID No.: 1130  
2.5 CAS Registry No.: 76-22-2  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51628

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Eye protection
- 3.2 **Symptoms Following Exposure:** Within 5 to 90 minutes after swallowing, the following may be noted: nausea and vomiting; feeling of warmth; headache; confusion, vertigo, excitement, restlessness, delirium, and hallucinations; increased muscular excitability, tremors, and jerky movements; epileptiform convulsions, followed by depression (convulsions sometimes occur early in the syndrome and may be severe, but they do not have the grave prognosis of strychnine convulsions); coma; central nervous depression may at times be the primary clinical response; death results from respiratory failure or from status epilepticus; slow convalescence (days or weeks), often with persistent gastric distress.
- 3.3 **Treatment of Exposure:** For an oral intoxication, administer gastric lavage, cathartics, diuretics, and sedatives. Control convulsions with a short-acting barbiturate, chloral hydrate, or ether. Do NOT use analeptics or opiates.
- 3.4 **TLV-TWA:** 2 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 3 ppm
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 200 mg/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 2 mg/m<sup>3</sup>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 117°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** The solid often evaporates without first melting.
- 4.7 **Auto Ignition Temperature:** 466°C
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 64.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: (3)  
Human Oral hazard: 2  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Each lot of camphor oil has a unique composition, which varies with the time of year and the country of origin. At least a dozen grades are known. Most camphor sold in the U.S. is synthetic and is quite pure.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** 347 - 392°F = 175 - 200°C = 448 - 473°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.923 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CAMPHOR OIL

CPO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
32	57.430	32	0.478	32	0.901	32	14.250
34	57.430	34	0.478	34	0.901	34	13.960
36	57.430	36	0.478	36	0.901	36	13.670
38	57.430	38	0.478	38	0.901	38	13.400
40	57.430	40	0.478	40	0.901	40	13.130
42	57.430	42	0.478	42	0.901	42	12.870
44	57.430	44	0.478	44	0.901	44	12.620
46	57.430	46	0.478	46	0.901	46	12.380
48	57.430	48	0.478	48	0.901	48	12.140
50	57.430	50	0.478	50	0.901	50	11.900
52	57.430	52	0.478	52	0.901	52	11.680
54	57.430	54	0.478	54	0.901	54	11.460
56	57.430	56	0.478	56	0.901	56	11.240
58	57.430	58	0.478	58	0.901	58	11.030
60	57.430	60	0.478	60	0.901	60	10.830
62	57.430	62	0.478	62	0.901	62	10.630
64	57.430	64	0.478	64	0.901	64	10.440
66	57.430	66	0.478	66	0.901	66	10.250
68	57.430	68	0.478	68	0.901	68	10.070
70	57.430	70	0.478	70	0.901	70	9.890
72	57.430	72	0.478	72	0.901	72	9.715
74	57.430	74	0.478	74	0.901	74	9.546
76	57.430	76	0.478	76	0.901	76	9.380
78	57.430	78	0.478	78	0.901	78	9.218
80	57.430	80	0.478	80	0.901	80	9.061

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CALCIUM PHOSPHIDE

CPP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Photophor	Solid Gray Musty odor  Reacts violently with water. Poisonous, flammable vapor is produced.
Evacuate. <b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. IGNITES WHEN EXPOSED TO MOISTURE. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR PRODUCED IN REACTION WITH WATER. POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. DUST Irritating to eyes. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CaP}_2$
- 2.3 IMO/UN Designation: 4.3/1360
- 2.4 DOT ID No.: 1360
- 2.5 CAS Registry No.: 1305-99-3
- 2.6 NAERG Guide No.: 139
- 2.7 Standard Industrial Trade Classification: 52492

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; protective gloves and clothing; goggles.
- 3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes faintness, weakness, nausea, vomiting. External contact with dust causes irritation of eyes and skin.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; call a physician and alert to possibility of phosphine poisoning. EYES or SKIN: flush with water. INGESTION: give large amounts of water; call physician and alert to possibility of phosphine poisoning.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** 1-100 mg/m<sup>3</sup>
- 3.13 **IDLH Value:** Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable but may ignite spontaneously if wetted.
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Extinguish adjacent fires with dry chemical or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Can cause spontaneous ignition if wet. Contributes dense smoke of phosphoric acid.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously, generating phosphine (a poisonous, spontaneously flammable gas).
- 5.2 **Reactivity with Common Materials:** Can react with surface moisture to evolve phosphine, which is toxic and spontaneously flammable.
- 5.3 **Stability During Transport:** Stable if dry
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Sealed containers must be in well-ventilated area.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Dangerous When Wet
- 8.2 **49 CFR Class:** 4.3
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 182.2
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** (approx.) 2,910°F = 1,600°C = 1,870°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.51 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CALCIUM PHOSPHIDE

CPP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CYCLOPROPANE

CPR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Trimethylene	Liquefied gas	Colorless	Mild sweet odor
Floats and boils on water. Flammable visible vapor cloud is produced.			
<div>Keep people away.</div> <div>Avoid inhalation.</div> <div>Shut off ignition sources and call fire department.</div> <div>Evacuate area in case of large discharge.</div> <div>Stay upwind. Use water spray to "knock down" vapor.</div> <div>Avoid contact with liquid.</div> <div>Notify local health and pollution control agencies.</div>			
<b>Fire</b>	<b>FLAMMABLE.</b> Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Let fire burn. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water.		
<b>Exposure</b>	Call for medical aid.  <b>VAPOR</b> If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Will cause frostbite. Flush affected areas with plenty of water. <b>DO NOT RUB AFFECTED AREAS.</b>		
<b>Water Pollution</b>	Not harmful to aquatic life.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: C<sub>3</sub>H<sub>6</sub>
- 2.3 IMO/UN Designation: 2/1027
- 2.4 DOT ID No.: 1027
- 2.5 CAS Registry No.: 75-19-4
- 2.6 NAERG Guide No.: 115
- 2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus for high concentrations of vapor; safety goggles or face shield.
- 3.2 **Symptoms Following Exposure:** Inhalation causes some analgesia, anesthesia, pupil dilation, shallow depth of respirations, decreasing muscle tone. Contact with liquid may cause frostbite.
- 3.3 **Treatment of Exposure:** INHALATION: remove promptly to fresh air; if symptoms of asphyxia- tion persist, administer artificial respiration and oxygen; treat symptomatically thereafter. SKIN: if frostbite has occurred, apply warm water; treat burn.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Flammable gas
- 4.2 **Flammable Limits in Air:** 2.4%-10.3%
- 4.3 **Fire Extinguishing Agents:** Shut off flow of gas.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode.
- 4.7 **Auto Ignition Temperature:** 932°F
- 4.8 **Electrical Hazards:** Class I, Group C
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 11.5%  
- 11.7%; CO<sub>2</sub> diluent: 14.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.5+%; USP
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2.1
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 42.1
- 9.3 **Boiling Point at 1 atm:** -27.2°F = -32.9°C = 240.3°K
- 9.4 **Freezing Point:** -197.3°F = -127.4°C = 145.8°K
- 9.5 **Critical Temperature:** 256.5°F = 124.7°C = 397.9°K
- 9.6 **Critical Pressure:** 798 psia = 54.2 atm = 5.50 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.676 at -33°C (liquid)
- 9.8 **Liquid Surface Tension:** 22 dynes/cm = 0.022 N/m at -40°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 1.48
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1790
- 9.12 **Latent Heat of Vaporization:** 203 Btu/lb = 113 cal/g = 4.73 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** 21,247 Btu/lb = -11,804 cal/g = 493.88 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 30.92 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# CYCLOPROPANE

CPR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-110	45.790	-110	0.429	-35	0.947	-110	0.208
-105	45.580	-105	0.431	-30	0.937	-105	0.204
-100	45.360	-100	0.434			-100	0.200
-95	45.140	-95	0.436			-95	0.197
-90	44.930	-90	0.438			-90	0.193
-85	44.710	-85	0.440			-85	0.190
-80	44.490	-80	0.443			-80	0.187
-75	44.280	-75	0.445			-75	0.184
-70	44.060	-70	0.447			-70	0.181
-65	43.840	-65	0.449			-65	0.178
-60	43.630	-60	0.452			-60	0.175
-55	43.410	-55	0.454			-55	0.173
-50	43.190	-50	0.456			-50	0.170
-45	42.980	-45	0.458			-45	0.168
-40	42.760	-40	0.461			-40	0.165
-35	42.540	-35	0.463			-35	0.163
-30	42.330	-30	0.465			-30	0.161

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		-125	0.523	-125	0.00612	0	0.272
		-120	0.649	-120	0.00749	20	0.283
		-115	0.801	-115	0.00911	40	0.295
		-110	0.982	-110	0.01102	60	0.306
		-105	1.198	-105	0.01325	80	0.318
		-100	1.453	-100	0.01585	100	0.329
		-95	1.753	-95	0.01886	120	0.341
		-90	2.104	-90	0.02233	140	0.352
		-85	2.514	-85	0.02631	160	0.364
		-80	2.989	-80	0.03087	180	0.375
		-75	3.537	-75	0.03606	200	0.387
		-70	4.168	-70	0.04195	220	0.398
		-65	4.892	-65	0.04861	240	0.410
		-60	5.718	-60	0.05611	260	0.421
		-55	6.658	-55	0.06452	280	0.432
		-50	7.723	-50	0.07394	300	0.444
		-45	8.927	-45	0.08443	320	0.455
		-40	10.280	-40	0.09610	340	0.467
		-35	11.810	-35	0.10900	360	0.478
		-30	13.510	-30	0.12330	380	0.490
		-25	15.410	-25	0.13910	400	0.501
		-20	17.530	-20	0.15640	420	0.513
		-15	19.880	-15	0.17540	440	0.524
		-10	22.490	-10	0.19610	460	0.536
		-5	25.360	-5	0.21880	480	0.547
		0	28.530	0	0.24340	500	0.559

# CAUSTIC POTASH SOLUTION

CPS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lye Potassium hydroxide solution	Thick liquid Colorless Odorless  Sinks and mixes with water.
Keep people away. AVOID CONTACT WITH LIQUID. Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 5; Caustic
- 2.2 Formula: KOH+H<sub>2</sub>O
- 2.3 IMO/UN Designation: 8.0/1814
- 2.4 DOT ID No.: 1814
- 2.5 CAS Registry No.: 1310-58-3
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52264

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wide-brimmed hat and close-fitting safety goggles equipped with rubber side shields; long-sleeved cotton shirt or jacket with buttoned collar and buttoned sleeves; rubber or rubber-coated canvas gloves. (Shirt sleeves should be buttoned over the gloves so that any spilled material will run down the outside.) Rubber safety-toe-shoes or boots and cotton coveralls. (Trousers cuffs should be worn outside of boots.) Rubber apron.
- 3.2 **Symptoms Following Exposure:** Causes severe burns of eyes, skin, and mucous membranes.
- 3.3 **Treatment of Exposure:** (Act quickly!) EYES: flush with water for at least 15 min. SKIN: flush with water, then rinse with dilute vinegar (acetic acid). INGESTION: give water and milk. Do NOT induce vomiting. Call physician at once, even when injury seems to be slight.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 2 mg/m<sup>3</sup>
- 3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 365 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** None
- 5.2 **Reactivity with Common Materials:**  
Attacks wool, leather and some metals such as aluminum, tin, lead and zinc to produce flammable hydrogen gas. Separate from easily ignitable materials.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water and rinse with dilute acid such as acetic acid.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
80 ppm/24 hr/mosquito fish/TL<sub>50</sub>/fresh water  
(These figures are for 100% potassium hydroxide.)
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 45-50%
- 7.2 **Storage Temperature:** Ambient or elevated
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	1
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** >266°F = >130°C = >403°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.45-1.50 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) -17 Btu/lb = -10 cal/g = -0.4 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 35.3 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CAUSTIC POTASH SOLUTION

CPS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	90.509	35 40 45 50 55 60 65 70 75 80 85 90 95 100	0.652 0.654 0.657 0.660 0.663 0.665 0.668 0.671 0.674 0.677 0.679 0.682 0.685 0.688		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

## CAPTAN

CPT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Orthocide N-[(Trichloromethyl)thio]-4-cyclohexene-1,2,-dicarbodimide Vanicide	Solid  White to brown  Slight odor  Sinks in water.
<b>KEEP PEOPLE AWAY.</b> Avoid inhalation. <b>AVOID CONTACT WITH SOLID AND DUST.</b> Shut off ignition sources and call fire department. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stay upwind, use water spray to "knock down" dust. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge  
Do not burn

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_8H_6Cl_3NO_2S$   
2.3 IMO/UN Designation: 6.1/9099  
2.4 DOT ID No.: 2588  
2.5 CAS Registry No.: 133-06-2  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 59110

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask, rubber gloves, and goggles.  
3.2 **Symptoms Following Exposure:** Vapor irritates eyes. Ingestion causes depression, lachrymation, labored respiration, diarrhea.  
3.3 **Treatment of Exposure:** Remove from exposure; keep airways open; administer artificial respiration if necessary. EYES: flush with water for 15 min. and get medical attention. SKIN: wash with soap and water. INGESTION: maintain respiration; induce vomiting (lavage stomach if patient is unconscious); give symptomatic and supportive treatment; save agent and vomitus for laboratory examination.  
3.4 **TLV-TWA:** 5 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral rat LD<sub>50</sub> = 480 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None observed in several species.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, carbon dioxide, foam, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating and toxic gases are produced in a fire; they may include sulfur dioxide, hydrogen chloride, phosgene, and oxides of nitrogen.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 53.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 30 ppm/24 hr/zebrafish/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** >5,000 ppm LC<sub>50</sub>  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Bioaccumulation not likely  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 90-97%; also available as dusts, wettable powders, and aqueous suspension.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 300.6  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** 338°F = 170°C = 443°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.74 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -7,100 Btu/lb = -3,940 cal/g = -165 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# CAPTAN

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CHLOROACETOPHENONE

CRA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> alpha-Chloroacetophenone omega-Chloroacetophenone Chloromethyl phenyl ketone Phenacyl chloride Phenyl chloromethylketone Tear gas	Solid  Sinks in water.	White to light yellow	Sharp odor
<b>Evacuate.</b> <b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Stay upwind. Use water spray to "knock down" dust. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Flood discharge area with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Collection Systems: Skim; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $\text{C}_6\text{H}_5\text{COCH}_2\text{Cl}$ 2.3 IMO/UN Designation: 6.1/1697 2.4 DOT ID No.: 1697 2.5 CAS Registry No.: 532-27-4 2.6 NAERG Guide No.: 153 2.7 Standard Industrial Trade Classification: 51629
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Full-face organic canister mask; self-contained breathing apparatus; rubber gloves; protective clothing. <b>3.2 Symptoms Following Exposure:</b> Inhalation causes tearing, burning of the eyes and difficulty in breathing; high concentrations may lead to development of acute pulmonary edema after latencies of 8 hrs. to several days; possible systemic manifestations include agitation, coma, contraction of pupils of eyes, loss of reflexes. External contact causes irritation of skin and intense irritation of eyes. Ingestion causes agitation, coma, contraction of pupils of eye, loss of reflexes. <b>3.3 Treatment of Exposure:</b> INHALATION: remove victim from contaminated atmosphere at once; give artificial respiration and oxygen, if necessary; watch for pulmonary edema for several days. EYES: flush with water; do not rub. SKIN: flush with water. INGESTION: get medical attention; watch for development of pulmonary edema for several days. <b>3.4 TLV-TWA:</b> 0.05 ppm <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 3; oral $\text{LD}_{50}$ = 52 mg/kg (rat) <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Fatty infiltration of liver <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Currently not available <b>3.11 Liquid or Solid Characteristics:</b> Currently not available <b>3.12 Odor Threshold:</b> 0.016 ppm <b>3.13 IDLH Value:</b> 15 mg/m <sup>3</sup> <b>3.14 OSHA PEL-TWA:</b> 0.05 ppm <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** Combustible solid 244°F C.C. (solutions only)  
**4.2 Flammable Limits in Air:** Not pertinent  
**4.3 Fire Extinguishing Agents:** Water  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion Products:** Irritating hydrogen chloride may form.  
**4.6 Behavior in Fire:** Unburned material may become volatile and cause severe eye irritation.  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Not pertinent  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** Reacts slowly, generating hydrogen chloride. The reaction is not hazardous.  
**5.2 Reactivity with Common Materials:** Reacts slowly with metals, causing mild corrosion.  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Sometimes shipped as a solution in an organic solvent.  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Pressure-vacuum  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Poison  
**8.2 49 CFR Class:** 6.1  
**8.3 49 CFR Package Group:** II  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Solid  
**9.2 Molecular Weight:** 154.6  
**9.3 Boiling Point at 1 atm:** 477°F = 247°C = 520°K  
**9.4 Freezing Point:** 68-138°F = 20-59°C = 293-332°K  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 1.32 at 15°C (solid)  
**9.8 Liquid Surface Tension:** Not pertinent  
**9.9 Liquid Water Interfacial Tension:** Not pertinent  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
**9.12 Latent Heat of Vaporization:** Not pertinent  
**9.13 Heat of Combustion:** (est.) -9,340 Btu/lb = -5,190 cal/g = -217 X 10<sup>3</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# CHLOROACETOPHENONE

CRA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

# CHLOROBENZENE

CRB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzene chloride MCB Monochlorobenzene Phenyl chloride	Watery liquid	Colorless	Sweet, almond odor
Sinks in water. Flammable vapor is produced.			
<b>Keep people away. Avoid contact with liquid and vapor.</b> <b>Avoid inhalation.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR If inhaled, will cause coughing or dizziness. Not irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Pump; Dredge Do not burn Clean shore line	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 36; Halogenated hydrocarbon <b>2.2 Formula:</b> C <sub>6</sub> H <sub>5</sub> Cl <b>2.3 IMO/UN Designation:</b> 3.3/1134 <b>2.4 DOT ID No.:</b> 1134 <b>2.5 CAS Registry No.:</b> 108-90-7 <b>2.6 NAERG Guide No.:</b> 130 <b>2.7 Standard Industrial Trade Classification:</b> 51139
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Organic vapor-acid gas respirator where appropriate; neoprene or vinyl gloves; chemical safety spectacles, plus face shield where appropriate; rubber footwear; apron or impervious clothing for splash protection; hard hat. <b>3.2 Symptoms Following Exposure:</b> Irritating to skin, eyes and mucous membranes. Repeated exposure of skin may cause dermatitis due to defatting action. Chronic inhalation of vapors or mist may result in damage to lungs, liver, and kidneys. Acute vapor exposures can cause symptoms ranging from coughing to transient anesthesia and central nervous system depression. <b>3.3 Treatment of Exposure:</b> Get medical attention for all eye exposures and any serious over-exposures. Treat the symptoms. INHALATION: remove to clean air; administer oxygen as needed. INGESTION: dilute by drinking water; if vomiting occurs, administer more water. Administer saline laxative. EYES: flush thoroughly with water. SKIN: remove contaminated clothing, wash exposed area with soap and water. <b>3.4 TLV-TWA:</b> 10 ppm <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg (rat, rabbit) <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors are nonirritating to the eyes and throat. <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. <b>3.12 Odor Threshold:</b> 0.21 ppm <b>3.13 IDLH Value:</b> 1,000 ppm <b>3.14 OSHA PEL-TWA:</b> 75 ppm <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 97°F O.C. 84°F C.C.  
**4.2 Flammable Limits in Air:** 1.3%-9.6%  
**4.3 Fire Extinguishing Agents:** Carbon dioxide, dry chemical, foam or water spray  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion Products:** Burning in open flame can form toxic phosgene and hydrogen chloride gases.  
**4.6 Behavior in Fire:** Heavy vapor can travel a considerable distance to a source of ignition and flash back.  
**4.7 Auto Ignition Temperature:** 1099°F  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** (est.) 4.6 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** 20 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** 0.3 lb/lb, 5 days  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 99.5%; technical  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Pressure-vacuum  
**7.5 IMO Pollution Category:** B  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid  
**8.2 49 CFR Class:** 3  
**8.3 49 CFR Package Group:** III  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** 100 pounds  
**8.7 EPA Pollution Category:** B  
**8.8 RCRA Waste Number:** U037/D021  
**8.9 EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 112.56  
**9.3 Boiling Point at 1 atm:** 270°F = 132°C = 405°K  
**9.4 Freezing Point:** -50.1°F = -45.6°C = 227.6°K  
**9.5 Critical Temperature:** 678.2°F = 359°C = 632.2°K  
**9.6 Critical Pressure:** 656 psia = 44.6 atm = 4.52 MN/m<sup>2</sup>  
**9.7 Specific Gravity:** 1.11 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** 33 dynes/cm = 0.033 N/m at 25°C  
**9.9 Liquid Water Interfacial Tension:** 37.41 dynes/cm = 0.03741 N/m at 20°C  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** 1.094  
**9.12 Latent Heat of Vaporization:** 135 Btu/lb = 75 cal/g = 3.140 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** (est.) 12,000 Btu/lb = 6700 cal/g = 280 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** 20.40 cal/g  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 0.5 psia

## NOTES



# CHLOROBENZENE

CRB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	70.419	40	0.316	-20	0.956	35	1.027
40	70.230	50	0.317	-10	0.946	40	0.987
45	70.040	60	0.319	0	0.937	45	0.949
50	69.849	70	0.321	10	0.927	50	0.914
55	69.660	80	0.323	20	0.917	55	0.880
60	69.469	90	0.325	30	0.908	60	0.848
65	69.270	100	0.327	40	0.898	65	0.818
70	69.080	110	0.329	50	0.888	70	0.790
75	68.889	120	0.331	60	0.879	75	0.763
80	68.700	130	0.333	70	0.869	80	0.738
85	68.500	140	0.335	80	0.859	85	0.713
90	68.309	150	0.337	90	0.850	90	0.690
95	68.120	160	0.339	100	0.840	95	0.668
100	67.919	170	0.341	110	0.830	100	0.648
105	67.730	180	0.343	120	0.821	105	0.628
110	67.530	190	0.345	130	0.811	110	0.609
115	67.339	200	0.347	140	0.801	115	0.591
120	67.139	210	0.349	150	0.792	120	0.574
125	66.950			160	0.782	125	0.558
130	66.750			170	0.772	130	0.542
135	66.559					135	0.527
140	66.360					140	0.513
145	66.169					145	0.499
150	65.969					150	0.486
155	65.770					155	0.473
160	65.580						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.049	20	0.032	20	0.00071	0	0.178
		30	0.048	30	0.00102	25	0.188
		40	0.069	40	0.00145	50	0.198
		50	0.099	50	0.00204	75	0.207
		60	0.140	60	0.00283	100	0.217
		70	0.195	70	0.00386	125	0.226
		80	0.269	80	0.00522	150	0.235
		90	0.366	90	0.00698	175	0.244
		100	0.492	100	0.00923	200	0.252
		110	0.656	110	0.01207	225	0.261
		120	0.865	120	0.01565	250	0.269
		130	1.130	130	0.02010	275	0.277
		140	1.464	140	0.02560	300	0.285
		150	1.880	150	0.03233	325	0.292
		160	2.394	160	0.04051	350	0.300
		170	3.026	170	0.05039	375	0.307
		180	3.797	180	0.06224	400	0.314
		190	4.731	190	0.07636	425	0.320
		200	5.856	200	0.09309	450	0.327
		210	7.203	210	0.11280	475	0.333
						500	0.340
						525	0.345
						550	0.351
						575	0.357
						600	0.362

# CHROMOUS CHLORIDE

CRC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chromium chloride Chromium dichloride	Solid White to blue  Sinks and mixes with water.
Keep people away. AVOID CONTACT WITH SOLID AND DUST. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber gloves. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data is not available.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration.  SOLID Irritating to skin and eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Collection Systems: Dredge Cover with organic sulfur containing compounds or sulfur	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: CrCl <sub>2</sub> 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 9102 2.5 CAS Registry No.: 10049-05-5 2.6 NAERG Guide No.: 171 2.7 Standard Industrial Trade Classification: 52329
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Rubber gloves, safety glasses, respirator, protective clothing. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Nasal irritation, septal perforation, pulmonary irritation. EYES: Irritation. SKIN: Irritation and ulceration. INGESTION: Violent G.I. irritation with vomiting and diarrhea. 3.3 <b>Treatment of Exposure:</b> Call a physician. INHALATION: Move to fresh air. EYES: Flush with copious amounts of water. SKIN: Wash with soap and plenty of water. INGESTION: If conscious, make victim drink water or milk, then induce vomiting. 3.4 TLV-TWA: 0.5 mg/m <sup>3</sup> as Cr. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Possible carcinogen and mutagen. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 250 mg/m <sup>3</sup> as Cr <sup>6+</sup> 3.14 OSHA PEL-TWA: 1.0 mg/m <sup>3</sup> as Cr 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Currently not available  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** On standing in solution it is oxidized by water with liberation of H<sub>2</sub>. Keep well closed.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Very hygroscopic; stable in dry air but oxidizes rapidly if moist. Powerful reducing agent. Keep container well closed.  
5.4 **Neutralizing Agents for Acids and Caustics:** Mix with equal volume of soda ash and add water. Add calcium hypochlorite. Add more water and let stand for two hours. Neutralize oxidized solution. (Check with litmus and neutralize with 6M HCl or 6M NaOH.) Flush with large excess of water.  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Oxidizes to trivalent chromic condition. 1.2 to 2.4 mg/l lethal limit for sticklebacks  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Vented storage recommended  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 122.92  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** 1515°F = 824°C = 1097°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 2.751 at 14°C, 2.878 at 25°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** For anhydrous CrCl<sub>2</sub> -273 Btu/lb = -151.6 cal/g = -6.34 X 10<sup>3</sup> J/kg  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** 65.9 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# CHROMOUS CHLORIDE

CRC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# CALCIUM RESINATE

CRE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Calcium abietate Calcium resinate, fused Calcium rosin Limed wood rosin Metallic resinate	Solid  Yellow to dark brown  Odorless   Sinks in water.
<b>Keep people away. Avoid inhalation. Shut off ignition sources and call fire department. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. MAY IGNITE WHEN EXPOSED TO AIR. Extinguish with dry chemicals, foam or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (approx.)  $\text{Ca}(\text{OOC}_{18}\text{H}_{35})_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 1313  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 133  
2.7 Standard Industrial Trade Classification: 51379

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; gloves  
3.2 **Symptoms Following Exposure:** Inhalation of fumes from heated chemical may cause irritation of nose and throat. Ingestion causes irritation of nose and throat. Contact with eyes causes irritation. Contact of molten material with skin causes burns.  
3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air; get medical help immediately. INGESTION: give large amounts of water; induce vomiting. EYES: flush immediately with cold water; get medical help immediately. SKIN: if molten chemical burns skin, apply cold water immediately; get medical help for burn treatment.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 480°F (may ignite spontaneously)  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable solid  
8.2 **49 CFR Class:** 4.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 643 (approx.)  
9.3 **Boiling Point at 1 atm:**  $>600^{\circ}\text{F} = >316^{\circ}\text{C} = >589^{\circ}\text{K}$   
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.13 at 25°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CALCIUM RESINATE

CRE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CHLOROFORM

CRF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Trichloromethane	Watery liquid      Colorless      Sweet odor
Sinks in water. Irritating vapor is produced.	
Keep people away. Avoid inhalation. Avoid contact with liquid and vapor. Stay upwind. Wear goggles and self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS AND IRRITATING GASES ARE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, nausea, dizziness, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS AND HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 36; Halogenated hydrocarbon  
2.2 Formula: CHCl<sub>3</sub>  
2.3 IMO/UN Designation: 9.0/1888  
2.4 DOT ID No.: 1888  
2.5 CAS Registry No.: 67-66-3  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 51138

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical goggles, 50 ppm to 2%; suitable full-face gas mask. Above 2%; suitable self-contained system.  
3.2 **Symptoms Following Exposure:** Headache, nausea, dizziness, drunkenness, narcosis.  
3.3 **Treatment of Exposure:** INHALATION: if ill effects develop, get victim to fresh air, keep him warm and quiet, and get medical attention. If breathing stops, start artificial respiration. INGESTION: induce vomiting and get medical attention. No known antidote; treat symptoms. EYES: flush with plenty of water for at least 15 minutes and get medical attention. SKIN: wash with soap and water, remove contaminated clothing and free of chemical.  
3.4 **TLV-TWA:** 10 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 205-307 ppm  
3.13 **IDLH Value:** 500 ppm  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 50 ppm  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion**  
Products: Poisonous and irritating gases are produced when heated.  
4.6 **Behavior in Fire:** Decomposes, producing toxic gases  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, USP  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: U044/D022  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 119.39  
9.3 **Boiling Point at 1 atm:** 142°F = 61.2°C = 334.4°K  
9.4 **Freezing Point:** -82.3°F = -63.5°C = 209.7°K  
9.5 **Critical Temperature:** 505.8°F = 263.2°C = 536.4°K  
9.6 **Critical Pressure:** 790 psia = 54 atm = 5.5 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.49 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 27.1 dynes/cm = 0.0271 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 32.8 dynes/cm = 0.0328 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 4.1  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.146  
9.12 **Latent Heat of Vaporization:** 106.7 Btu/lb = 59.3 cal/g = 2.483 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 17.62 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 6.39 psia

### NOTES

# CHLOROFORM

CRF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-50	100.799	0	0.216	-70	0.938	0	0.847
-40	100.200	10	0.217	-60	0.929	10	0.791
-30	99.549	20	0.219	-50	0.920	20	0.741
-20	98.910	30	0.221	-40	0.911	30	0.697
-10	98.259	40	0.222	-30	0.902	40	0.656
0	97.610	50	0.224	-20	0.893	50	0.620
10	96.950	60	0.226	-10	0.884	60	0.586
20	96.299	70	0.227	0	0.875	70	0.556
30	95.639	80	0.229	10	0.866	80	0.528
40	94.980	90	0.231	20	0.857	90	0.503
50	94.320	100	0.232	30	0.848	100	0.479
60	93.650	110	0.234	40	0.839	110	0.458
70	92.990	120	0.236	50	0.830	120	0.438
80	92.320	130	0.237	60	0.821	130	0.420
90	91.650	140	0.239	70	0.812	140	0.403
100	90.980			80	0.804		
110	90.309			90	0.795		
120	89.629			100	0.786		
130	88.950			110	0.777		
140	88.270			120	0.768		
				130	0.759		
				140	0.750		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.800	-30	0.150	-30	0.00387	0	0.123
		-20	0.217	-20	0.00548	25	0.126
		-10	0.309	-10	0.00763	50	0.129
		0	0.433	0	0.01047	75	0.131
		10	0.598	10	0.01417	100	0.134
		20	0.816	20	0.01892	125	0.137
		30	1.099	30	0.02496	150	0.139
		40	1.462	40	0.03255	175	0.142
		50	1.924	50	0.04198	200	0.144
		60	2.505	60	0.05361	225	0.146
		70	3.229	70	0.06781	250	0.148
		80	4.124	80	0.08499	275	0.150
		90	5.220	90	0.10560	300	0.152
		100	6.551	100	0.13020	325	0.154
		110	8.157	110	0.15930	350	0.156
		120	10.080	120	0.19340	375	0.158
						400	0.160
						425	0.161
						450	0.162
						475	0.164
						500	0.165
						525	0.166
						550	0.167
						575	0.168
						600	0.169

# O-CHLOROPHENOL

CRH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Chloro-1-hydroxybenzene 2-Hydroxychlorobenzene Phenol, 2-chloro- Phenol, o-chloro-	Liquid  Colorless to amber  Unpleasant, penetrating  Sinks and slowly mixes.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear positive pressure breathing apparatus and special chemical protective clothing. Shut off ignition sources and call fire department. Stay upwind and use water spray to knock down vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. Wear positive breathing apparatus and special chemical protective clothing. Combat fires from safe distance or protected location. Extinguish small fires with dry chemical, carbon dioxide, water spray or foam; large fires with water spray, fog or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS. MAY BE FATAL IF INHALED OR ABSORBED THROUGH SKIN. Inhalation can cause liver and kidney damage. Irritating to skin and eyes. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS. MAY BE FATAL IF SWALLOWED OR ABSORBED THROUGH SKIN. Can cause severe skin and eye irritation; may cause burns. IF IN EYES OR ON SKIN, flush contaminated area with running water for at least 15 minutes; hold upper and lower eyelids open occasionally if appropriate. Speed in removing material from skin is extremely important. Remove and isolate contaminated clothing and shoes. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Oc1ccccc1Cl  
2.3 IMO/UN Designation: 6.1/2021 2021  
2.4 DOT ID No.: 2021  
2.5 CAS Registry No.: 95-57-8  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51244

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear positive pressure breathing apparatus and special chemical protective clothing.
- 3.2 **Symptoms Following Exposure:** Poisonous; may be fatal if inhaled, swallowed or absorbed through skin. Irritating to skin and eyes; direct contact may cause burns. Rats receiving lethal doses via oral, subcutaneous or intraperitoneal routes displayed similar symptoms: restlessness, increased breathing rate and motor weakness followed by tremors, chronic convulsions, dyspnea, coma and death.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Immediately flush with running water for at least 15 minutes; hold upper and lower eyelids open occasionally. SKIN: Immediately flush skin with running water for at least 15 minutes. Speed in removing material from skin is extremely important. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. INGESTION: If swallowed and victim is unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 670 mg/kg (mouse; rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: It produced tumorigenic effects and reproductive effects. Rat toxicity studies showed marked injury to the kidneys, fatty infiltration of the liver, and hemorrhages in the intestines. Inhalation can cause liver and kidney damage.  
3.10 Vapor (Gas) Irritant Characteristics: The vapors are irritating and toxic.  
3.11 Liquid or Solid Characteristics: Strong irritant to tissue. Contact may cause burns to skin and eyes.  
3.12 Odor Threshold: 0.019 mg/m<sup>3</sup>  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 147°F C.C.  
4.2 Flammable Limits in Air: 1.7 % (calculated)  
4.3 Fire Extinguishing Agents: Small fires: dry chemical, carbon dioxide, water spray or foam. Large Fires: Alcohol foam.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Contain poisonous chloride fumes.  
4.6 Behavior in Fire: Burns and produces toxic and irritating gases.  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 30.9 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 9.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Sodium bicarbonate  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
8.4 ppm/96hr/bluegill fingerlings/TL<sub>50</sub>/ fresh water (cold water)  
8.2 ppm/24hr/bluegill sunfish/TL<sub>50</sub>/fresh water (warm water)  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: Not listed  
7.4 Venting: Not listed  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: U048  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 128.56  
9.3 Boiling Point at 1 atm: 346.1°F = 174.5°C = 447.7°K  
9.4 Freezing Point: 48.7°F = 9.3°C = 282.5°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 1.25 at 25°C  
9.8 Liquid Surface Tension: 40.3 dynes/cm = 0.040 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 4.5  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: 144.8 Btu/lb = 80.4 cal/g = 3.4 X 10<sup>6</sup> J/kg  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES



# O-CHLOROPHENOL

CRH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	78.860		C		C	70	3.806
70	78.780		U		U	75	3.625
72	78.700		R		R	80	3.444
74	78.620		R		R	85	3.263
76	78.540		E		E	90	3.082
78	78.460		N		N	95	2.901
80	78.380		T		T	100	2.720
82	78.300		L		L	105	2.539
84	78.220		Y		Y	110	2.359
86	78.140						
			N O T		N O T		
			A V A I L A B L E		A V A I L A B L E		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.850	75	0.042	20	0.00070		C
		100	0.115	40	0.00343		U
		125	0.252	60	0.00868		R
		150	0.478	80	0.01675		R
		175	0.821	100	0.02791		E
		200	1.312	120	0.04234		N
		225	1.984	140	0.06023		T
		250	2.871				L
		275	4.012				Y
		300	5.445				
							N O T
							A V A I L A B L E

# M-CRESOL

CRL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 3-Cresol m-Cresylic acid 3-Hydroxytoluene m-Methylphenol	Liquid  Colorless  Sweet tarry odor  Sinks and mixes slowly with water.
<b>Keep people away. Avoid contact with liquid. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	COMBUSTIBLE. POISONOUS FLAMMABLE GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID. Will burn skin and eyes. Poisonous if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Chemical and Physical Treatment:  
Neutralize  
Do not burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 21; Phenols, cresols  
2.2 **Formula:** CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>OH  
2.3 **IMO/UN Designation:** 6.1/2076  
2.4 **DOT ID No.:** 2076  
2.5 **CAS Registry No.:** 108-39-4  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51242

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles or face shield, respiratory protective equipment, full protective clothing including boots and gloves. Hard hat or brimmed, felt hat.
- 3.2 **Symptoms Following Exposure:** INHALATION: Mucosal irritation and systemic poisoning EYES: Intense irritation and pain, swelling of conjunctiva, and corneal damage may occur. SKIN: Intense burning, loss of feeling, wrinkling, white discoloration, and softening. Gangrene may occur. INGESTION: Burning sensation in mouth and esophagus. Vomiting may result. Acute exposure by all routes may cause muscular weakness, gastroenteric disturbances, severe depression, collapse. Effects are primarily on CNS and edema of lungs. Injury of spleen and pancreas may occur.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Move to fresh air. Irritation of nose or throat may be relieved to some extent by spraying or gargling with water until all odor disappears. For respiratory distress administer oxygen. EYES: Irrigate with copious quantities of running water for at least 15 min. SKIN: Remove contaminated clothing. Wash with soap and water until all cresol odor disappears. Follow with alcohol or glycerin (20% solution) wash. Follow with water. INGESTION: Dilute with large quantities of liquid (salt water, weak sodium bicarbonate solution, milk or gruel). Follow with demulcent such as raw egg white or corn starch paste. Induce vomiting.
- 3.4 **TLV-TWA:** 5 ppm.  
3.5 **TLV-STEL:** Not listed. Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Chronic exposure may cause digestive disturbances, nervous disorders, and may damage liver and kidneys. Dermatitis may result from prolonged contact.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation, such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant, usually causing pain and second-degree burns after a few minutes contact.  
3.12 **Odor Threshold:** 0.68 ppm for detection in water.  
3.13 **IDLH Value:** 250 ppm  
3.14 **OSHA PEL-TWA:** 5 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 202°F C.C.  
4.2 **Flammable Limits in Air:** 1.06%-1.35% 302°F.  
4.3 **Fire Extinguishing Agents:** CO<sub>2</sub>, dry chemical, foam, water spray.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Emits highly toxic fumes.  
4.6 **Behavior in Fire:** Vapor may form explosive mixture with air.  
4.7 **Auto Ignition Temperature:** 1038°F.  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
25 ppm/24 hr/Crucian carp/LC<sub>50</sub>  
23 ppm/24 hr/Roach/LC<sub>50</sub>  
21 ppm/24 hr/Tench/LC<sub>50</sub>  
7 ppm/24 hr/Trout embryos/LC<sub>50</sub>  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 68%, 5 days; 1.70 g/g for 5 days.  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 60 to 98% containing other cresols and xylenols.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U052/D024  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 108.134.  
9.3 **Boiling Point at 1 atm:** 397°F = 203°C = 476.2°K.  
9.4 **Freezing Point:** 52.7°F = 11.5°C = 284.7°K.  
9.5 **Critical Temperature:** 809.6°F = 432°C = 705.2°K.  
9.6 **Critical Pressure:** 661.3 psia = 45.0 atm = 4.56 MN/m<sup>2</sup>.  
9.7 **Specific Gravity:** 1.0336 at 20°C.  
9.8 **Liquid Surface Tension:** 41.7 dynes/cm = 0.0417 N/m at 20°C.  
9.9 **Liquid Water Interfacial Tension:** 31.3 dynes/cm = 0.0313 N/m at 20°C.  
9.10 **Vapor (Gas) Specific Gravity:** 3.72.  
9.11 **Ratio of Specific Heats of Vapor (Gas):** >1 - 1.05 (est.).  
9.12 **Latent Heat of Vaporization:** 181.1 Btu/lb = 100.6 cal/g = 4.2 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -14036 Btu/lb = -7798 cal/g = -326 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# M-CRESOL

CRL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
180	61.437	20	0.555	70	1.038	50	45.202
190	61.155			75	1.036	55	34.985
200	60.873			80	1.034	60	27.689
210	60.591			85	1.032	65	22.329
220	60.309			90	1.030	70	18.296
230	60.027			95	1.027	75	15.199
240	59.746			100	1.025	80	12.778
250	59.464			105	1.023	85	10.856
260	59.182			110	1.021	90	9.310
270	58.900			115	1.019	95	8.051
280	58.618			120	1.016	100	7.014
290	58.336						
300	58.054						
310	57.772						
320	57.490						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		127	0.014	127	0.00033	625	0.493
		128	0.018	128	0.00035	650	0.503
		129	0.023	129	0.00036	675	0.512
		130	0.029	130	0.00038	700	0.522
		131	0.036	131	0.00040	725	0.532
		132	0.045	132	0.00041	750	0.542
		133	0.057	133	0.00043	775	0.552
		134	0.072	134	0.00045	800	0.562
		135	0.091	135	0.00047	825	0.571
		136	0.114	136	0.00048	850	0.581
		137	0.144	137	0.00050	875	0.591
		138	0.181	138	0.00052	900	0.601
		139	0.228	139	0.00053	925	0.611
		140	0.287	140	0.00055	950	0.621
						975	0.630
						1000	0.640
						1025	0.650
						1050	0.660
						1075	0.670
						1100	0.680
						1125	0.690
						1150	0.699
						1175	0.709
						1200	0.719
						1225	0.729
						1250	0.739

# P-CHLOROTOLUENE

CRN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Chloro-4-methylbenzene 4-Chloro-1-methylbenzene 4-Chlorotoluene p-Tolyl chloride	Liquid  Colorless   Sinks slowly in water.
Keep people away. Avoid contact with liquid. Avoid inhalation. Wear goggles and self-contained breathing apparatus. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE Wear goggles and self-contained breathing apparatus. Extinguish with alcohol foam, carbon dioxide or dry chemical.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Chemical and Physical Treatment:  
Absorb  
Dilute and disperse dissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Currently not available; Halogenated compound  
2.2 **Formula:** C<sub>7</sub>H<sub>7</sub>Cl  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** 2238  
2.5 **CAS Registry No.:** 106-43-4  
2.6 **NAERG Guide No.:** 130  
2.7 **Standard Industrial Trade Classification:** 51139

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Respirator with proper filter, goggles.  
3.2 **Symptoms Following Exposure:** INHALATION: Irritation of respiratory system. EYES AND SKIN: Severe irritation. INGESTION: Severe internal damage if swallowed.  
3.3 **Treatment of Exposure:** Get medical aid. INHALATION: Move to fresh air. Remove contaminated clothing. Keep warm and quiet. If breathing has stopped give artificial respiration. EYES AND SKIN: Wash with plenty of water. INGESTION: Give one or two glasses of water or milk. Induce vomiting. Give cathartics.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 120°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Alcohol foam; CO<sub>2</sub>; dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** Currently not available  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Currently not available  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** 1-10 ppm/96 hour/Finfish/TL<sub>m</sub>  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 2  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 126.6  
9.3 **Boiling Point at 1 atm:** 324°F = 162°C = 435.2°K  
9.4 **Freezing Point:** 45.5°F = 7.50°C = 280.7°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.0697 at 20°C  
9.8 **Liquid Surface Tension:** 32.24 dynes/cm = 0.03224 N/m at 25°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.36 (estimated)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** At boiling point 136.8 Btu/lb = 76 cal/g = 3.18 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# P-CHLOROTOLUENE

CRN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	66.780	32	0.316		C	50	0.102
69	66.780				U	60	0.094
70	66.783				R	70	0.087
71	66.783				R	80	0.082
72	66.785				E	90	0.076
73	66.787				N	100	0.072
74	66.787				T	110	0.067
75	66.789				L	120	0.064
					Y	130	0.060
						140	0.057
					N	150	0.054
					O	160	0.051
					T	170	0.048
						180	0.046
					A	190	0.043
					V	200	0.041
					A	210	0.039
					I		
					L		
					A		
					B		
					L		
					E		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	110	0.070	50	0.00047		C
	N	120	0.109	55	0.00055		U
	S	130	0.164	60	0.00064		R
	O	140	0.239	65	0.00075		R
	L	150	0.338	70	0.00088		E
	U	160	0.469	75	0.00104		N
	B	170	0.638	80	0.00122		T
	L	180	0.853	85	0.00143		L
	E	190	1.122	90	0.00168		Y
		200	1.455	95	0.00197		
		210	1.863	100	0.00231		N
		220	2.358	105	0.00270		O
		230	2.954	110	0.00317		T
		240	3.665	115	0.00372		
		250	4.507	120	0.00437		A
		260	5.499	125	0.00512		V
		270	6.658	130	0.00601		A
		280	8.005	135	0.00705		I
		290	9.563	140	0.00827		L
		300	11.356				A
		310	13.409				B
		320	15.751				L
		330	18.409				E

# O-CRESOL

CRO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Cresol o-Hydroxytoluene 2-Methylphenol o-Toluid	Solid crystals or liquid    Colorless to yellow    Sweet tarry odor  Sinks and mixes slowly with water.
Keep people away. Avoid contact with liquid and solid. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water fog, dry chemical, foam or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Will burn skin and eyes. Poisonous if swallowed, inhaled or if skin is exposed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Contain  
 Collection Systems: Pump; Dredge  
 Chemical and Physical Treatment:  
 Neutralize  
 Do not burn  
 Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 21; Phenols, cresols  
 2.2 **Formula:** CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>OH  
 2.3 **IMO/UN Designation:** 6.1/2076  
 2.4 **DOT ID No.:** 2076  
 2.5 **CAS Registry No.:** 95-48-7  
 2.6 **NAERG Guide No.:** 153  
 2.7 **Standard Industrial Trade Classification:** 51242

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical goggles or face shields, full protective clothing including boots and gloves, and respiratory protective apparatus.
- 3.2 **Symptoms Following Exposure:** INHALATION, INGESTION OR SKIN ABSORPTION: Central nervous system depression, muscular weakness, gastroenteric disturbances, convulsions and death. EYES: can cause burns. SKIN: Corrosive action may produce severe burns.
- 3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Move to fresh air. Oxygen inhalation for respiratory distress. If needed, give artificial respiration. EYES: Irrigate with copious quantities of running water for 15 min. Hold eyelids open. If physician not available irrigate for an additional 15 min. SKIN: Remove all contaminated clothing. Wash with soap and water until all odor is gone. Then wash contaminated areas with alcohol or glycerin. Then use more water. INGESTION: Drink large quantities of liquid (salt water, weak sodium bicarbonate solution, milk or gruel) followed by demulcent such as raw egg white or corn starch paste. Induce vomiting, if not spontaneous. Keep up until vomitus is free of Cresol odor.
- 3.4 **TLV-TWA:** 5 ppm.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 - 500 mg/kg.  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** May produce neoplasms or act as tumor promoters. Central nervous system damage. Chronic gastritis, possible liver and kidney damage, and lesions of heart and brain. Dermatitis may result.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.
- 3.12 **Odor Threshold:** 0.65 ppm detection in water 0.26 ppm recognition in air.  
 3.13 **IDLH Value:** 250 ppm  
 3.14 **OSHA PEL-TWA:** 5 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 178°F C.C.  
 4.2 **Flammable Limits in Air:** 1.35%  
 4.3 **Fire Extinguishing Agents:** Water may be used to blanket fire, CO<sub>2</sub>, dry chemical, foam, water spray (gently applied).  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Emits highly toxic fumes.  
 4.6 **Behavior in Fire:** Vapors form explosive mixtures with air.  
 4.7 **Auto Ignition Temperature:** 1110°F.  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Will not occur.  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 49.1-19 ppm/24-96 hr/goldfish/TL<sub>m</sub>/soft water  
 22.2-20.8 ppm/24-96 hr/bluegill/TL<sub>m</sub>/soft water  
 18-13.4 ppm/24-96 hr/fathead minnow/TL<sub>m</sub>/hard water  
 18-50 ppm/24-96 hr/guppy/TL<sub>m</sub>/hard water  
 6.2 **Waterfowl Toxicity:** Chronic water fowl toxic limit is 25 ppm.  
 6.3 **Biological Oxygen Demand (BOD):** 1.64 lb/lb, 5 days.  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 80-98% containing 2-20% phenol. 99.2% with 0.2% phenol and 0.6% meta and para isomers.  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open  
 7.5 **IMO Pollution Category:** A  
 7.6 **Ship Type:** 2  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
 8.2 **49 CFR Class:** 6.1  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** Yes  
 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 100 pounds  
 8.7 **EPA Pollution Category:** B  
 8.8 **RCRA Waste Number:** D023  
 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
 9.2 **Molecular Weight:** 108.134.  
 9.3 **Boiling Point at 1 atm:** 376°F = 191°C = 464.2°K  
 9.4 **Freezing Point:** 88°F = 31°C = 304.2°K  
 9.5 **Critical Temperature:** 795.9°F = 424.4°C = 697.6°K  
 9.6 **Critical Pressure:** 726.0 psia = 49.4 atm = 5.00 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 1.05 at 20°C.  
 9.8 **Liquid Surface Tension:** 40.3 dynes/cm = 0.0403 N/m at 20°C.  
 9.9 **Liquid Water Interfacial Tension:** 32.7 dynes/cm = 0.0327 N/m at 20°C.  
 9.10 **Vapor (Gas) Specific Gravity:** 3.72.  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** >1.  
 9.12 **Latent Heat of Vaporization:** 178.4 Btu/lb = 99.12 cal/g = 4.15 X 10<sup>5</sup> J/kg.  
 9.13 **Heat of Combustion:** -13994 Btu/lb = -7774 cal/g = -325 X 10<sup>6</sup> J/kg.  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# O-CRESOL

CRO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
70	65.459	20	0.555	90	1.055	104	4.490
75	65.235			95	1.052	105	4.380
80	65.025			100	1.050	106	4.270
85	64.829			105	1.047	107	4.160
90	64.643			110	1.045	108	4.050
95	64.466			115	1.042	109	3.940
100	64.301			120	1.040	110	3.830
105	64.141			125	1.037	111	3.720
110	63.991			130	1.035	112	3.610
115	63.846			135	1.032	113	3.500
120	63.708			140	1.030		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		100	0.020	90	0.00024	80	0.290
		120	0.048	95	0.00030	100	0.298
		140	0.101	100	0.00037	120	0.306
		160	0.192	105	0.00044	140	0.315
		180	0.340	110	0.00053	160	0.323
		200	0.566	115	0.00063	180	0.331
		220	0.899	120	0.00074	200	0.339
		240	1.370	125	0.00087	220	0.347
		260	2.018	130	0.00101	240	0.355
		280	2.890			260	0.363
		300	4.036			280	0.371
		320	5.518			300	0.379
		340	7.401			320	0.387
		360	9.761			340	0.395
						360	0.403
						380	0.411
						400	0.420
						420	0.428
						440	0.436

# CHLOROPRENE

CRP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Chlorobutadiene 2-Chloro-1,3-butadiene 2-Chlorobuta-1,3-diene beta-Chloroprene	Liquid  Colorless  Slight etheric  Floats and mixes slowly with water. Flammable, irritating vapor is produced.
<b>Evacuate.</b> <b>Keep people away. Avoid contact with liquid and vapor.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber clothing (including gloves).</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Flammable. POISONOUS GAS IS PRODUCED IN FIRE. Flashback along vapor trail may occur. Containers may explode in fire. Wear self-contained breathing apparatus. Combat fires from safe distance or protected location. Extinguish with alcohol foam. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. If inhaled will cause difficult breathing and asphyxia. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain undissolved material  
Dilute and disperse dissolved material  
Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_2\text{CHCClCH}_2$   
2.3 IMO/UN Designation: 3.2/1991  
2.4 DOT ID No.: 1991  
2.5 CAS Registry No.: 126-99-8  
2.6 NAERG Guide No.: 131P  
2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety goggles, air line or self-contained oxygen mask.
- 3.2 **Symptoms Following Exposure:** INHALATION: Fatigue, psychic changes, irritability, oppression in chest, occasionally substernal pain, tachycardia upon exertion. EYES: Can cause conjunctivitis, corneal necrosis and edema of eyelids. SKIN: May cause dermatitis and temporary loss of hair. Rapidly absorbed by skin.
- 3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Prompt removal from exposure. If not breathing give artificial respiration. If respiration is impaired, oxygen should be given. EYES: Flush with water. SKIN: Clean with soap and water. INGESTION: Gastric lavage followed by saline catharsis.
- 3.4 TLV-TWA: 10 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 50 to 500 mg/kg.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** May cause dermatitis, conjunctivitis, corneal necrosis, anemia, loss of hair (temporary), nervousness, and irritability. CNS depression and significant injury to lungs, liver, and kidneys. Suspected carcinogen, and mutagen. In animal experiments has caused degenerative changes of reproductive organs with the males being more susceptible.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** 0.40 mg/m<sup>3</sup> (recognition).
- 3.13 IDLH Value: 300 ppm
- 3.14 OSHA PEL-TWA: 25 ppm
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -4°F C.C.
- 4.2 **Flammable Limits in Air:** 4% lower, 20% upper
- 4.3 **Fire Extinguishing Agents:** Alcohol foam
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Decomposes yielding toxic fumes
- 4.6 **Behavior in Fire:** Dangerous when exposed to heat or flame
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 23.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Currently not available
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Polymerizes readily under the influence of light and catalysts
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Finfish/TL<sub>96</sub> hour = 10 to 100 ppm
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Cool
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid
- 8.2 49 CFR Class: 3
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: 100 pounds
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 88.54
- 9.3 **Boiling Point at 1 atm:** 138.92°F = 59.4°C = 332.6°K
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.9583 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 3.0
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** (est.) 164 Btu/lb = 91.2 cal/g = 3.8 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** per mole of monomer at 61.3°C (142.34°F) 3.30 Btu/lb = 183.6 cal/g = 7.68 X 10<sup>5</sup> J/kg
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# CHLOROPRENE

CRP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	59.820		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y	45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135	1.575 1.779 2.010 2.270 2.564 2.897 3.272 3.696 4.174 4.715 5.326 6.016 6.795 7.676 8.670 9.793 11.062 12.494 14.113	25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135	0.01554 0.01746 0.01961 0.02203 0.02474 0.02779 0.03122 0.03507 0.03940 0.04425 0.04971 0.05584 0.06272 0.07046 0.07914 0.08890 0.09986 0.11218 0.12601 0.14155 0.15900 0.17860 0.20063		C U R R E N T L Y  N O T  A V A I L A B L E

# CRESOLS

CRS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cresylic acids Hydroxytoluenes Methylphenols Oxytoluenes Tar acids	Waterly liquid, or solid crystals  Colorless or yellow  Sweet tarry odor  Sinks in water.
<p>Keep people away. Avoid contact with liquid.  Avoid inhalation.  Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  Shut off ignition sources and call fire department.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Do not burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 21; Phenols, Cresols
- 2.2 Formula:  $\text{CH}_3\text{C}_6\text{H}_4\text{OH}$
- 2.3 IMO/UN Designation: 9.0/2076
- 2.4 DOT ID No.: 2076
- 2.5 CAS Registry No.: 1319-77-3
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51242

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor canister unit (USBM Type B) approved by U.S. Bureau of Mines. Rubber gloves; chemical safety goggles; face shield; coveralls and/or rubber apron; rubber shoes or boots.
- 3.2 **Symptoms Following Exposure:** Vapors cause irritation of eyes, nose, and throat. Contact with skin or eyes causes severe burns. Chemical is rapidly absorbed through skin.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: remove to fresh air. INGESTION: have victim drink water or milk; do NOT induce vomiting. SKIN OR EYES: flush immediately with plenty of water for at least 15 min.; remove contaminated clothing immediately and wash before reuse; discard contaminated shoes.
- 3.4 **TLV-TWA:** 5 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50}$  = 0.5 to 5 g/kg (rat, rabbit)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second- degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** 5 ppm
- 3.13 **IDLH Value:** 250 ppm
- 3.14 **OSHA PEL-TWA:** 5 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 175-185°F O.C.; 178°F C.C.
- 4.2 **Flammable Limits in Air:** LEL: 1.4% (ortho); 1.1% (meta or para)
- 4.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide, and foam
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Flammable toxic vapors given off in a fire.
- 4.6 **Behavior in Fire:** Sealed closed containers can build up pressure if exposed to heat
- 4.7 **Auto Ignition Temperature:** 1110°F (o-cresol) 1038°F (m- or p-cresol)
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 24 mg/l/96 hr/bluegill/TL<sub>50</sub>/fresh water 10-100 ppm/48 hr/shrimp/LC<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** m-cresol: 170%, 5 days o-cresol: 164%, 5 days p-cresol: 144%, 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** USP Liquid (mixed isomers) Phenol-cresol mixtures Ortho-cresol 80 to 98% containing phenol Meta-cresol 60 to 98% containing other cresols and xylenols Para-cresol 92 to 98% containing meta- cresol Meta-para-cresol containing ortho- cresol and xylenols "Resin" cresols containing phenols and xylenols Cresylic acids containing xylenols, cresols and phenols
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** A
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: Yes
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	3 3
Flammability (Red).....	2 1
Instability (Yellow).....	0 0
- 8.6 EPA Reportable Quantity: 100 pounds
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: U052
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 108.13
- 9.3 Boiling Point at 1 atm: 376°F = 191°C = 464°K
- 9.4 Freezing Point: Varies with composition
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.03-1.07 at 20°C (liquid)
- 9.8 Liquid Surface Tension: 37 dynes/cm = 0.037 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): 1.073
- 9.12 Latent Heat of Vaporization: (est.) 200 Btu/lb = 110 cal/g = 4.6 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: -14,720 to -14,740 Btu/lb = -8180 to -8190 cal/g = -342.5 to -342.9 X 10<sup>5</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: 26.28 cal/g (p-Cresol)
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: 0.03 psia

NOTES

# CRESOLS

CRS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	65.469	46	0.490	52	1.048	40	15.050
40	65.349	48	0.490	54	1.048	50	12.020
45	65.230	50	0.490	56	1.048	60	9.678
50	65.110	52	0.490	58	1.048	70	7.858
55	64.990	54	0.490	60	1.048	80	6.430
60	64.860	56	0.490	62	1.048	90	5.300
65	64.740	58	0.490	64	1.048	100	4.399
70	64.620	60	0.490	66	1.048	110	3.675
75	64.500	62	0.490	68	1.048	120	3.089
80	64.379	64	0.490	70	1.048	130	2.612
85	64.259	66	0.490	72	1.048	140	2.221
90	64.139	68	0.490	74	1.048	150	1.899
95	64.009	70	0.490	76	1.048	160	1.632
100	63.890	72	0.490	78	1.048	170	1.409
		74	0.490	80	1.048	180	1.222
		76	0.490	82	1.048	190	1.064
		78	0.490	84	1.048	200	0.931
		80	0.490	86	1.048	210	0.818
		82	0.490	88	1.048		
		84	0.490	90	1.048		
		86	0.490	92	1.048		
		88	0.490	94	1.048		
		90	0.490	96	1.048		
		92	0.490	98	1.048		
		94	0.490	100	1.048		
		96	0.490	102	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.200	40	0.004	40	0.00008	0	0.236
		60	0.008	60	0.00016	20	0.246
		80	0.017	80	0.00032	40	0.257
		100	0.034	100	0.00060	60	0.267
		120	0.062	120	0.00109	80	0.276
		140	0.111	140	0.00187	100	0.286
		160	0.192	160	0.00312	120	0.296
		180	0.319	180	0.00502	140	0.305
		200	0.514	200	0.00785	160	0.314
		220	0.805	220	0.01193	180	0.323
		240	1.230	240	0.01771	200	0.332
		260	1.835	260	0.02568	220	0.341
		280	2.679	280	0.03648	240	0.350
		300	3.834	300	0.05084	260	0.358
		320	5.387	320	0.06960	280	0.366
		340	7.442	340	0.09374	300	0.375
						320	0.382
						340	0.390
						360	0.398
						380	0.405
						400	0.413
						420	0.420
						440	0.427

# CHROMIC ACETATE

CRT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, chromium salt Chromic (III) acetate Chromium acetate Chromium triacetate	Solid powder or aqueous solution  Dark green to violet  Acetic acid odor  Sinks and mixes with water.
<b>Keep people away. Avoid contact with solid, dust, or liquid. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber clothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration.  LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Collection Systems: Dredge Cover with organic material containing sulfides	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> Not listed. <b>2.2 Formula:</b> Cr(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) <sub>3</sub> Cr(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) <sub>3</sub> ·H <sub>2</sub> O CrOH(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) <sub>2</sub> - basic acetate <b>2.3 IMO/UN Designation:</b> Not listed <b>2.4 DOT ID No.:</b> 9101 <b>2.5 CAS Registry No.:</b> 1066-30-4 <b>2.6 NAERG Guide No.:</b> 171 <b>2.7 Standard Industrial Trade Classification:</b> 51371
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Rubber gloves, safety glasses, laboratory coat. If powder becomes airborne, wear approved mechanical filter respirator. <b>3.2 Symptoms Following Exposure:</b> INHALATION: Irritating. It can produce ulcerations in the respiratory system, perforation of the nasal septum, pneumonitis and bronchial carcinoma. EYES: Irritation. SKIN: May cause dermatitis to exposed skin. Can produce ulcerations and sensitizing reactions. <b>3.3 Treatment of Exposure:</b> Get medical aid. INHALATION: Move to fresh air. EYES: Wash with large amounts of water, get medical attention. SKIN: Wash with large amounts of water. <b>3.4 TLV-TWA:</b> 0.5 mg/m <sup>3</sup> as Cr. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Currently not available <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Possible carcinogen. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Currently not available <b>3.11 Liquid or Solid Characteristics:</b> Currently not available <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> 25 mg/m <sup>3</sup> as Cr <sup>III</sup> <b>3.14 OSHA PEL-TWA:</b> 1.0 mg/m <sup>3</sup> as Cr. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:**  
Not flammable
- 4.2 Flammable Limits in Air:** Not flammable
- 4.3 Fire Extinguishing Agents:** Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 Special Hazards of Combustion Products:** Not pertinent
- 4.6 Behavior in Fire:** Currently not available
- 4.7 Auto Ignition Temperature:** Not flammable
- 4.8 Electrical Hazards:** Not pertinent
- 4.9 Burning Rate:** Not flammable
- 4.10 Adiabatic Flame Temperature:** Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 Flame Temperature:** Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction
- 5.2 Reactivity with Common Materials:** No reaction
- 5.3 Stability During Transport:** Stable
- 5.4 Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 Polymerization:** Will not occur
- 5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
Trivalent chromium will not interfere with fish life at a concentration of 1.0 mg/l, and other aquatic life at 0.05 mg/l.
- 6.2 Waterfowl Toxicity:** Currently not available
- 6.3 Biological Oxygen Demand (BOD):** 50%, 5 days (trivalent Cr)
- 6.4 Food Chain Concentration Potential:** Currently not available
- 6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Currently not available
- 7.2 Storage Temperature:** Ambient
- 7.3 Inert Atmosphere:** Currently not available
- 7.4 Venting:** Currently not available
- 7.5 IMO Pollution Category:** Currently not available
- 7.6 Ship Type:** Currently not available
- 7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed.
- 8.2 49 CFR Class:** Not pertinent
- 8.3 49 CFR Package Group:** Not listed.
- 8.4 Marine Pollutant:** No
- 8.5 NFPA Hazard Classification:** Not listed
- 8.6 EPA Reportable Quantity:** 1000 pounds
- 8.7 EPA Pollution Category:** C
- 8.8 RCRA Waste Number:** Not listed
- 8.9 EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Solid
- 9.2 Molecular Weight:** 229.14 (anhydrous); 247.16 (hydrate)
- 9.3 Boiling Point at 1 atm:** 212°F = 100°C = 373.2°K For aqueous solution
- 9.4 Freezing Point:** Currently not available
- 9.5 Critical Temperature:** Currently not available
- 9.6 Critical Pressure:** Currently not available
- 9.7 Specific Gravity:** 1.30
- 9.8 Liquid Surface Tension:** Currently not available
- 9.9 Liquid Water Interfacial Tension:** Currently not available
- 9.10 Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 Latent Heat of Vaporization:** Currently not available
- 9.13 Heat of Combustion:** Currently not available
- 9.14 Heat of Decomposition:** Currently not available
- 9.15 Heat of Solution:** Currently not available
- 9.16 Heat of Polymerization:** Not pertinent
- 9.17 Heat of Fusion:** Currently not available
- 9.18 Limiting Value:** Currently not available
- 9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# CHROMIC ACETATE

CRT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# CHLOROSULFONIC ACID

CSA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlorosulfuric acid Chlorosulfonic acid Sulfuric chlorhydrin	Liquid  Colorless to light yellow  Sharp, choking odor  Reacts violently with water. Appears to explode. Poisonous gas is produced.
Evacuate. Keep people away. <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	May cause fire on contact with combustibles. Flammable, explosive gases may be formed on contact with metals and moisture. <b>DO NOT USE WATER.</b> Use dry chemicals or carbon dioxide. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  VAPOR Irritating to eyes, nose, and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk. <b>DO NOT INDUCE VOMITING.</b>
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** See Table 1, Compatibility Guide; Special case  
2.2 **Formula:** ClSO<sub>3</sub>H  
2.3 **IMO/UN Designation:** 8.0/1754  
2.4 **DOT ID No.:** 1754  
2.5 **CAS Registry No.:** 7790-94-5  
2.6 **NAERG Guide No.:** 137  
2.7 **Standard Industrial Trade Classification:** 52236

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Acid-proof goggles or a rubber hood, long rubber gloves, rubber shoes, long rubber apron, shirt and trousers of wool or acrylic fiber, and a hat with a brim. For emergency use involving considerable exposure, a complete rubber suit with hood, gloves and boots of rubber should be used. In case of fire use self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** INHALATION: vapor extremely irritating to lungs and mucous membranes. Vapor has such a sharp and penetrating odor that inhalation of severely toxic quantities is unlikely unless it is impossible to escape the fumes. CONTACT WITH EYES OR SKIN: liquid acid will severely burn body tissue.
- 3.3 **Treatment of Exposure:** Call a physician in all cases. INHALATION: remove victim to fresh air; if he is not breathing, apply artificial respiration; give oxygen if breathing is difficult; do NOT induce vomiting. SKIN: flush with plenty of water for at least 15 min. while removing contaminated clothing and shoes.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Severe eye and throat irritant. Can cause eye or lung injury and cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact; very injurious to the eyes.
- 3.12 **Odor Threshold:** 1-5 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water
- 4.5 **Special Hazards of Combustion Products:** Decomposes into irritating and toxic gases
- 4.6 **Behavior in Fire:** Although nonflammable, it may ignite other combustibles. Contact with water AND metal produces explosive hydrogen gas.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently with water, forming hydrochloric acid (vapor) and sulfuric acid.
- 5.2 **Reactivity with Common Materials:** Hydrogen, a highly flammable and explosive gas, is generated by the action of the acid on most metals. May cause ignition by contact with combustible materials.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Although the acid reacts violently with water, flooding (from a distance) must be carried out before neutralizing with lime water or sodium bicarbonate solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
282 ppm/96 hr/mosquito fish/TL<sub>50</sub>/fresh water  
100-300 ppm/48 hr/shrimp/LC<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 1  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 2              |
| Special (White).....      | W OX           |
- 8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCL List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 116.53  
9.3 **Boiling Point at 1 atm:** 311°F = 155°C = 428°K  
9.4 **Freezing Point:** -112°F = -80°C = 193°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.75 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** (est.) 198 Btu/lb = 110 cal/g = 4.6 X 10<sup>3</sup> J/kg  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.03 psia

### NOTES

# CHLOROSULFONIC ACID

CSA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	111.000	60	0.280		N		N
50	110.400	65	0.280		O		O
60	109.900	70	0.280		T		T
70	109.299	75	0.280				
80	108.700	80	0.280		P		P
90	108.200	85	0.280		E		E
100	107.599	90	0.280		R		R
110	107.099	95	0.280		T		T
120	106.500	100	0.280		I		I
130	106.000	105	0.280		N		N
140	105.400	110	0.280		E		E
150	104.799	115	0.280		N		N
160	104.299	120	0.280		T		T
170	103.700	125	0.280				
180	103.200	130	0.280				
190	102.599	135	0.280				
200	102.000	140	0.280				
210	101.500	145	0.280				
		150	0.280				
		155	0.280				
		160	0.280				
		165	0.280				
		170	0.280				
		175	0.280				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	70	0.006	70	0.00013		C
	E	75	0.009	75	0.00017		U
	A	80	0.011	80	0.00023		R
	C	85	0.015	85	0.00030		R
	T	90	0.019	90	0.00038		E
	S	95	0.025	95	0.00049		N
		100	0.032	100	0.00063		T
		105	0.042	105	0.00080		L
		110	0.053	110	0.00101		Y
		115	0.068	115	0.00128		
		120	0.086	120	0.00161		N
		125	0.109	125	0.00202		O
		130	0.137	130	0.00252		T
		135	0.172	135	0.00313		
		140	0.214	140	0.00388		A
		145	0.267	145	0.00479		V
		150	0.331	150	0.00589		A
		155	0.409	155	0.00722		I
		160	0.504	160	0.00893		L
		165	0.618	165	0.01075		A
		170	0.757	170	0.01305		B
		175	0.923	175	0.01579		L
							E

# CRESYLATE SPENT CAUSTIC SOLUTION

CSC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cresylate spent caustic		Liquid
		Mixes with water.
Keep people away. AVOID CONTACT WITH LIQUID. Wear self-contained, positive pressure breathing apparatus and full protective clothing. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable If water is removed, the solids may ignite spontaneously in air to produce toxic and corrosive sodium monoxide fumes. Extinguish small fires: dry chemicals (NO AMMONIUM SALTS OR UREA), carbon dioxide, water spray or foam; large fires: water spray or foam.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Contact causes burns to skin and eyes. Harmful if swallowed. Remove and isolate contaminated clothing and shoes at the site. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open periodically if appropriate. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	Effects on low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 5; Caustics
- 2.2 Formula: Not pertinent
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: Currently not available

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained (positive pressure if available) breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation of mist may be harmful. Contact causes burns to eyes and skin. Caustic; harmful if swallowed.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If victim is conscious, have victim drink water or milk. DO NOT INDUCE VOMITING. If victim is unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (Dry salt ignites spontaneously in air)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical (no ammonium salts or urea), carbon dioxide, water spray or foam; large fires: water spray, fog or foam. (Spilled material may ignite if allowed to dry.)
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use dry chemicals containing ammonium salts or urea. These compounds may react with the caustic solution to generate toxic ammonia gas.
- 4.5 **Special Hazards of Combustion Products:** Contain toxic and corrosive fumes of sodium monoxide (Na<sub>2</sub>O).
- 4.6 **Behavior in Fire:** Noncombustible; however, if heated to dryness, resulting solids may ignite spontaneously in air to yield toxic and corrosive fumes containing sodium monoxide (Na<sub>2</sub>O).
- 4.7 **Auto Ignition Temperature:** Not pertinent; however, spilled material may ignite in air after the water evaporates.
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Not pertinent
- 5.2 **Reactivity with Common Materials:**  
Contact not permitted with copper, copper alloys, zinc or aluminum.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Not pertinent
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** A
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** Currently not available
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Not pertinent
- 9.19 **Reid Vapor Pressure:** Not pertinent

### NOTES



# CRESYLATE SPENT CAUSTIC SOLUTION

CSC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# COPPER SULFATE

CSF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Blue vitriol Copper sulfate pentahydrate Cupric sulfate Sulfate of copper	Solid-granules or crystals  White to blue  Odorless  Sinks and mixes with water.
Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID If swallowed, will cause nausea, vomiting or loss of consciousness. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 9109
- 2.5 CAS Registry No.: 7758-98-7
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52349

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Filtering masks to minimize inhalation of dust.
- 3.2 **Symptoms Following Exposure:** INGESTION: copper sulfate may induce severe gastroenteric distress (vomiting, gastroenteric pain, and local corrosion and hemorrhages), prostration, anuria, hematuria, anemia, increase in white blood cells, icterus, coma, respiratory difficulties, and circulatory failure.
- 3.3 **Treatment of Exposure:** INGESTION: induce vomiting and administer gastric lavage; give a saline cathartic, fluid therapy, and transfusions if required; calcium disodium EDTA has been found moderately effective. SKIN AND EYES: wash affected tissues with water.
- 3.4 **TLV-TWA:** Notice of intended change: 0.05 mg Cu/m<sup>3</sup> respirable particles
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes liver, kidney and testicular damage in rats.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause second degree burns on long exposure.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 100 mg Cu/m<sup>3</sup> (dust, mist, fume)
- 3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as copper
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
3.8 ppm/24 hr/rainbow trout/TL<sub>50</sub>/fresh water  
0.14 ppm/48 hr/prawn/LC<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 249.7
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.29 at 15°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COPPER SULFATE

CSF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	14.450		N		N		N
36	14.810		O		O		O
38	15.160		T		T		T
40	15.520						
42	15.870		P		P		P
44	16.230		E		E		E
46	16.580		R		R		R
48	16.940		T		T		T
50	17.300		I		I		I
52	17.650		N		N		N
54	18.010		E		E		E
56	18.360		N		N		N
58	18.720		E		E		E
60	19.070		N		N		N
62	19.430		T		T		T
64	19.780						
66	20.140						
68	20.500						
70	20.850						
72	21.210						
74	21.560						
76	21.920						
78	22.270						
80	22.630						
82	22.980						
84	23.340						

# COPPER SULFATE, AMMONIATED

CSN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium cupric sulfate Copper ammonium sulfate Cuprammonium sulfate Cupric ammine sulfate Tetraammine copper sulfate	Solid  Dark blue  Ammonia odor  Sinks and mixes with water.
Notify local health and pollution control agencies. Avoid inhalation.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Harmful if swallowed. Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse dissolved material  
Stop discharge  
Contain undissolved material  
Collection Systems: Dredge  
Cover with organic sulfur containing compounds

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CuSO}_4 \cdot 4\text{NH}_3 \cdot \text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 9110  
2.5 CAS Registry No.: 10380-29-7  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 52349

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Currently not available  
3.2 Symptoms Following Exposure: INHALATION: Inhalation of dust may produce severe irritation of upper respiratory tract. Congestion of the nasal mucosa. EYES: May cause conjunctivitis and edema of eyelids. SKIN: May cause irritation. INGESTION: May induce severe gastroenteric distress: vomiting, pain, local corrosion, and hemorrhages.  
3.3 Treatment of Exposure: Call a physician. EYES: Flush with water. SKIN: Wash with water. INGESTION: Induce vomiting and administer gastric lavage. Give saline cathartic.  
3.4 TLV-TWA: Notice of intended change: 0.05 mg Cu/m<sup>3</sup> respirable particles  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Copper poisoning in animals leads to injury of liver, kidneys, and spleen.  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 100 mg Cu/m<sup>3</sup> (dust, mist, fumes)  
3.14 OSHA PEL-TWA: 0.1 mg/m<sup>3</sup> as copper  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Currently not available  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Currently not available  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Gives off ammonia when heated to 120°C.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: May release ammonia while present in water.  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Currently not available  
5.4 Neutralizing Agents for Acids and Causatics: Currently not available  
5.5 Polymerization: Currently not available  
5.6 Inhibitor of Polymerization: Currently not available

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 227.73 (anhydrous); 245.8 (monohydrate)  
9.3 Boiling Point at 1 atm: Hydrate loses H<sub>2</sub>O and 2NH<sub>3</sub> at 120°C and remaining 2NH<sub>3</sub> at 160°C. Decomposes at 150°C.  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 1.81 at 20°C; 1.79 at 25°C  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Currently not available  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# COPPER SULFATE, AMMONIATED

CSN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
18	70.700		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# P-CRESOL

CSO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 4-Hydroxytoluene p-Methylhydroxybenzene p-Methylphenol p-Toluid	Solid  Colorless  Tarlike odor  Sinks and mixes slowly with water.
<b>Keep people away. Avoid contact with liquid. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Poisonous if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Chemical and Physical Treatment:  
Neutralize  
Do not burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

**2.1 CG Compatibility Group:** 21; Phenols, cresols  
**2.2 Formula:**  $\text{CH}_3\text{C}_6\text{H}_4\text{OH}$   
**2.3 IMO/UN Designation:** 6.1/2076.  
**2.4 DOT ID No.:** 2076.  
**2.5 CAS Registry No.:** 106-44-5  
**2.6 NAERG Guide No.:** 153  
**2.7 Standard Industrial Trade Classification:** 51242

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Chemical goggles, full protective clothing including boots and gloves, self-contained breathing apparatus.
- 3.2 Symptoms Following Exposure:** INHALATION: Irritation of nose or throat. EYES: Intense irritation and pain, swelling of conjunctiva and corneal damage may occur. SKIN: Intense burning, loss of feeling, white discoloration and softening. Gangrene may occur. INGESTION: Burning sensation in mouth and esophagus. Vomiting may result. Absorption by all routes may cause muscular weakness, gastroenteric disturbance, severe depression and collapse. Effects are primarily on central nervous system, edema of lungs, injury of spleen and pancreas may occur.
- 3.3 Treatment of Exposure:** Call a physician. INHALATION: Move to fresh air. Irritation of nose or throat may be relieved to some extent by spraying or gargling with water until odor disappears. For respiratory distress administer oxygen. EYES: Irrigate with copious quantities of running water for at least 15 min. SKIN: Remove contaminated clothing. Wash with soap and water until all cresol odor disappears. Follow with alcohol or glycerin (20% solution) wash. Follow with water. INGESTION: Dilute with large quantities of liquid (salt water, weak sodium bicarbonate solution, milk or gruel). Follow with demulcent such as raw egg white or corn starch paste. Induce vomiting.
- 3.4 TLV-TWA:** 5 ppm.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50} = 50 - 500 \text{ mg/kg}$ .  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** May produce neoplasms or act as tumor promoters. Can cause central nervous system damage and chronic gastritis. Possible liver and kidney damage and lesions of the heart and brain. Can cause dermatitis.
- 3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.
- 3.12 Odor Threshold:** 0.2 ppm recognition in air; 0.46 ppb detection in air.  
**3.13 IDLH Value:** 250 ppm  
**3.14 OSHA PEL-TWA:** 5 ppm  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 187°F C.C.  
**4.2 Flammable Limits in Air:** 1.06%- 1.4%  
**4.3 Fire Extinguishing Agents:**  $\text{CO}_2$ , dry chemical, foam, water spray or fog.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may cause frothing.  
**4.5 Special Hazards of Combustion Products:** Emits highly toxic fumes.  
**4.6 Behavior in Fire:** Flammable toxic vapors may be given off.  
**4.7 Auto Ignition Temperature:** 1038°F.  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
21 ppm/24 hr/crucian carp/LC<sub>50</sub>  
17 ppm/24 hr/roach/LC<sub>50</sub>  
16 ppm/24 hr/fench/LC<sub>50</sub>  
24 ppm/48 hr/mosquito fish/TL<sub>50</sub>/pond  
10 ppm/96 hr/bluegill/TL<sub>50</sub>/distilled water  
**6.2 Waterfowl Toxicity:** Chronic waterfowl limit is 25 ppm.  
**6.3 Biological Oxygen Demand (BOD):** 1.4-1.48 lb/lb 5 days.  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 92-98% containing m-cresol.  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open  
**7.5 IMO Pollution Category:** A  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Poison  
**8.2 49 CFR Class:** 6.1  
**8.3 49 CFR Package Group:** II  
**8.4 Marine Pollutant:** Yes  
**8.5 NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity:** 100 pounds  
**8.7 EPA Pollution Category:** B  
**8.8 RCRA Waste Number:** U052/D025  
**8.9 EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Solid  
**9.2 Molecular Weight:** 108.134.  
**9.3 Boiling Point at 1 atm:** 395.46°F = 201.92°C = 475°K.  
**9.4 Freezing Point:** 94.6°F = 34.78°C = 307.93°K.  
**9.5 Critical Temperature:** 808.5°F = 431.4°C = 704.6°K.  
**9.6 Critical Pressure:** 746.7 psia = 50.8 atm = 5.15 MN/m<sup>2</sup>.  
**9.7 Specific Gravity:** 1.034 at 20°C.  
**9.8 Liquid Surface Tension:** 41.8 dynes/cm = 0.041 N/m at 40°C.  
**9.9 Liquid Water Interfacial Tension:** 31.2 dynes/cm = 0.0312 N/m at 40°C.  
**9.10 Vapor (Gas) Specific Gravity:** 3.72.  
**9.11 Ratio of Specific Heats of Vapor (Gas):** >1 - 1.05 (est.)  
**9.12 Latent Heat of Vaporization:** 188.7 Btu/lb = 104.85 cal/g = 4.39 X 10<sup>5</sup> J/kg.  
**9.13 Heat of Combustion:** -14014 Btu/lb = -7786 cal/g = -326 X 10<sup>6</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** 26.28 cal/g  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# P-CRESOL

CSO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
106	63.511	20	0.555	20	1.001	104	7.000
108	63.465					105	6.812
110	63.420					106	6.634
112	63.378					107	6.465
114	63.336					108	6.304
116	63.296					109	6.151
118	63.258					110	6.005
120	63.221					111	5.866
122	63.185					112	5.734
						113	5.607

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
105	2.454	105	0.013	104	0.00022	80	0.277
110	2.711	110	0.015	105	0.00023	100	0.286
115	2.945	115	0.018	106	0.00024	120	0.294
120	3.159	120	0.022	107	0.00025	140	0.303
125	3.356	125	0.025	108	0.00026	160	0.311
130	3.539	130	0.030	109	0.00027	180	0.319
135	3.707	135	0.035	110	0.00028	200	0.328
140	3.864	140	0.042	111	0.00029	220	0.336
145	4.010	145	0.049	112	0.00030	240	0.344
150	4.146	150	0.058	113	0.00031	260	0.353
155	4.273	155	0.069	114	0.00032	280	0.361
160	4.392	160	0.081	115	0.00032	300	0.369
165	4.505	165	0.096	116	0.00033	320	0.378
170	4.610	170	0.113			340	0.386
175	4.710	175	0.133			360	0.395
180	4.804	180	0.157			380	0.403
185	4.892	185	0.186			400	0.411
190	4.977					420	0.420
195	5.057					440	0.428
200	5.132						
205	5.205						
210	5.273						

# CAUSTIC SODA SOLUTION

CSS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lye Sodium hydroxide solution	Thick liquid Colorless Odorless  Sinks and mixes with water.
Keep people away. AVOID CONTACT WITH LIQUID. Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 5; Caustic
- 2.2 Formula: NaOH-H<sub>2</sub>O
- 2.3 IMO/UN Designation: 8.0/1824
- 2.4 DOT ID No.: 1824
- 2.5 CAS Registry No.: 1310-73-2
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52269

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wide-brimmed hat; safety goggles with rubber side shields; tight-fitting cotton clothing; rubber gloves under shirt cuffs; rubber boots and apron.
- 3.2 **Symptoms Following Exposure:** Causes severe burns of eyes, skin, and mucous membranes.
- 3.3 **Treatment of Exposure:** (Act quickly) EYES: flush with water at once for at least 15 min. SKIN: flush with water, then rinse with dilute vinegar (acetic acid). INGESTION: give water and milk. Do NOT induce vomiting. Call physician at once, even when injury seems to be slight.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 2 mg/m<sup>3</sup>
- 3.7 **Toxicity by Ingestion:** Grade 2; oral rabbit LD<sub>50</sub> = 500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 10 mg/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 2 mg/m<sup>3</sup>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Corrosive to aluminum, zinc, and tin.  
Contact with some metals may generate hydrogen gas, which is explosive and flammable.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water, rinse with dilute acetic acid.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
125 ppm/96 hr/mosquito fish/TL<sub>50</sub>/fresh water  
180 ppm/23 hr/oysters/lethal/salt water (These figures are for 100% sodium hydroxide.)
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 50-73%
- 7.2 **Storage Temperature:** Ambient or elevated
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	1
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** >266°F = >130°C = >403°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.5 at 20°C
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 50 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# CAUSTIC SODA SOLUTION

CSS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	93.629	77	0.780		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# COPPER SUBACETATE

CST

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Basic copper acetate Blue verdigris Common verdigris Cupric acetate, basic French verdigris Green verdigris	Solid crystals or powder  Blue to green  Sinks and mixes slowly with water.
Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Harmful if swallowed. Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Collection Systems: Dredge Cover with organic sulfur containing compounds	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> Not listed. <b>2.2 Formula:</b> Cu(C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> ) <sub>2</sub> ·CuO 6H <sub>2</sub> O <b>2.3 IMO/UN Designation:</b> Not listed <b>2.4 DOT ID No.:</b> Not listed <b>2.5 CAS Registry No.:</b> Currently not available <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 51372
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Currently not available <b>3.2 Symptoms Following Exposure:</b> INHALATION: Inhalation of dust may cause nasal congestion. EYES: May cause conjunctivitis and edema of eyelids. SKIN: Irritation. INGESTION: Vomiting caused by local irritant and astringent action of ionic copper on stomach and bowel. <b>3.3 Treatment of Exposure:</b> Call a doctor. EYES: flush with water. SKIN: Wash with water. INGESTION: Induce vomiting and administer gastric lavage. Give saline cathartic. <b>3.4 TLV-TWA:</b> Notice of intended change: 0.05 mg Cu/m <sup>3</sup> respirable particles <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Currently not available <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Copper poisoning in animals leads to injury of liver, kidneys, and spleen. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Not pertinent <b>3.11 Liquid or Solid Characteristics:</b> Currently not available <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> 100 mg Cu/m <sup>3</sup> (dust, mist, fumes) <b>3.14 OSHA PEL-TWA:</b> 0.1 mg/m <sup>3</sup> as copper <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** Currently not available  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Currently not available  
**4.4 Fire Extinguishing Agents Not to Be Used:** Currently not available  
**4.5 Special Hazards of Combustion Products:** Currently not available  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** Currently not available  
**5.2 Reactivity with Common Materials:** Currently not available  
**5.3 Stability During Transport:** Currently not available  
**5.4 Neutralizing Agents for Acids and Caustics:** Currently not available  
**5.5 Polymerization:** Currently not available  
**5.6 Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Currently not available  
**7.2 Storage Temperature:** Currently not available  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed  
**8.2 49 CFR Class:** Not pertinent  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Solid  
**9.2 Molecular Weight:** 369.26  
**9.3 Boiling Point at 1 atm:** Currently not available  
**9.4 Freezing Point:** Currently not available  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** Currently not available  
**9.8 Liquid Surface Tension:** Not pertinent  
**9.9 Liquid Water Interfacial Tension:** Not pertinent  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
**9.12 Latent Heat of Vaporization:** Not pertinent  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# COPPER SUBACETATE

CST

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CORN SYRUP

CSY

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Thick liquid	Colorless	Odorless
	Sinks and mixes with water.		
Notify local health and pollution control agencies.			
Fire	Not flammable.		
Exposure	Not harmful.		
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 43;  
Miscellaneous Water Solutions
- 2.2 Formula: Not pertinent
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification:  
Currently not available

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: None
- 3.2 Symptoms Following Exposure: Not toxic
- 3.3 Treatment of Exposure: None
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: None
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: None
- 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent
- 3.11 Liquid or Solid Characteristics: None
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:  
Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not flammable
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not flammable
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Liquid
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
None
- 6.2 Waterfowl Toxicity: None
- 6.3 Biological Oxygen Demand (BOD): 53%,  
5 days; 99% (theor.), 5 days
- 6.4 Food Chain Concentration Potential:  
None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: Not pertinent
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.4 at 37°C (liquid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas):  
Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# CORN SYRUP

CSY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	89.599	68	0.716		N		N
40	89.419	69	0.716		O		O
45	89.250	70	0.716		T		T
50	89.080	71	0.716				
55	88.900	72	0.716		P		P
60	88.730	73	0.716		E		E
65	88.559	74	0.716		R		R
70	88.379	75	0.716		T		T
75	88.209	76	0.716		I		I
80	88.040	77	0.716		N		N
85	87.860	78	0.716		E		E
90	87.690	79	0.716		N		N
95	87.520	80	0.716		T		T
100	87.339						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M		N		N		N
	I		O		O		O
	S		T		T		T
	C		P		P		P
	I		E		E		E
	B		R		R		R
	L		T		T		T
	E		I		I		I
			N		N		N
			E		E		E
			N		N		N
			T		T		T

# CROTONALDEHYDE

CTA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Crotonaldehyde Crotonic aldehyde beta-Methylacrolein trans-2-Butenal	Watery liquid      Yellow      Tar odor  Floats and mixes slowly with water. Flammable, irritating vapor is produced.
Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE:</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from safe distance or protected location. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause coughing, nausea, vomiting, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. <b>DO NOT INDUCE VOMITING.</b>
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

- Dilute and disperse
- Stop discharge
- Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 19; Aldehyde
- 2.2 Formula: CH<sub>3</sub>CH=CHCHO
- 2.3 IMO/UN Designation: 3.2/1143
- 2.4 DOT ID No.: 1143
- 2.5 CAS Registry No.: 4170-30-3
- 2.6 NAERG Guide No.: 131P
- 2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask for concentrations above 2% by volume; plastic gloves; monogoggles; eye bath and safety shower
- 3.2 **Symptoms Following Exposure:** INHALATION: vapor is exceedingly irritating, causing coughing, chest pain, nausea, vomiting, and collapse. CONTACT WITH SKIN OR EYES: may cause burns and systemic illness. Contact of liquid or vapors with eyes causes burns.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give oxygen if breathing is difficult; call a physician. INGESTION: have victim drink water or milk; do NOT induce vomiting. SKIN OR EYES: immediately flush with plenty of water for at least 15 min; physician should see cases of eye irritation from vapor or liquid.
- 3.4 TLV-TWA: 2 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second- degree burns after a few minutes contact.
- 3.12 **Odor Threshold:** 0.13 ppm
- 3.13 **IDLH Value:** 50 ppm
- 3.14 **OSHA PEL-TWA:** 2 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 59°F O.C.
- 4.2 **Flammable Limits in Air:** 2.1%-15.5%
- 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective on fire.
- 4.5 **Special Hazards of Combustion Products:** Vapors are very irritating to nose, eyes, and skin.
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 450°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 3.3 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 25.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Not flammable
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** May polymerize
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** May polymerize or condense with evolution of heat in presence of alkalis, amines, or acids.
- 5.6 **Inhibitor of Polymerization:** None used

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 1.3 lb/lb, 10 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 4  
 Human Oral hazard: 2  
 Human Contact hazard: II  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98.0%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** A
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	3
Instability (Yellow).....	2
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U053
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 70.09
- 9.3 **Boiling Point at 1 atm:** 216.0°F = 102.2°C = 375.4°K
- 9.4 **Freezing Point:** -100°F = -75°C = 198°K
- 9.5 **Critical Temperature:** 563.0°F = 295°C = 568.2°K
- 9.6 **Critical Pressure:** 630 psia = 43 atm = 4.4 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.852 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 2.4
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.104
- 9.12 **Latent Heat of Vaporization:** 200 Btu/lb = 111 cal/g = 4.65 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -14,000 Btu/lb = -7760 cal/g = -325 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 1.5 psia

### NOTES

# CROTONALDEHYDE

CTA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	54.160	85	0.547	32	1.040	32	1.041
50	53.810	90	0.552	34	1.040	34	1.021
60	53.460	95	0.557	36	1.040	36	1.001
70	53.110	100	0.562	38	1.040	38	0.982
80	52.770	105	0.567	40	1.040	40	0.964
90	52.420	110	0.572	42	1.040	42	0.945
100	52.070	115	0.577	44	1.040	44	0.928
110	51.730	120	0.582	46	1.040	46	0.911
120	51.380	125	0.587	48	1.040	48	0.894
130	51.030	130	0.592	50	1.040	50	0.878
140	50.690	135	0.597	52	1.040	52	0.862
150	50.340	140	0.602	54	1.040	54	0.846
160	49.990	145	0.607	56	1.040	56	0.831
170	49.650	150	0.612	58	1.040	58	0.817
180	49.300			60	1.040	60	0.802
190	48.950			62	1.040	62	0.788
200	48.610			64	1.040	64	0.775
210	48.260			66	1.040	66	0.762
						68	0.749
						70	0.736
						72	0.724
						74	0.712
						76	0.700
						78	0.689
						80	0.677

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	15.500	40	0.241	40	0.00315	0	0.275
		50	0.335	50	0.00429	25	0.285
		60	0.458	60	0.00575	50	0.294
		70	0.617	70	0.00760	75	0.304
		80	0.820	80	0.00992	100	0.314
		90	1.076	90	0.01279	125	0.323
		100	1.396	100	0.01629	150	0.332
		110	1.791	110	0.02053	175	0.341
		120	2.274	120	0.02561	200	0.350
		130	2.858	130	0.03165	225	0.359
		140	3.561	140	0.03877	250	0.368
		150	4.397	150	0.04709	275	0.377
		160	5.386	160	0.05675	300	0.385
		170	6.547	170	0.06789	325	0.394
		180	7.901	180	0.08065	350	0.402
		190	9.470	190	0.09517	375	0.410
		200	11.280	200	0.11160	400	0.418
		210	13.350	210	0.13010	425	0.426
		220	15.700	220	0.15080	450	0.434
		230	18.370	230	0.17400	475	0.442
		240	21.390	240	0.19960	500	0.449
		250	24.770	250	0.22790	525	0.457
		260	28.560	260	0.25910	550	0.464
		270	32.770	270	0.29320	575	0.471
		280	37.440	280	0.33050	600	0.478

# CATECHOL

CTC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Benzenediol Catechin 1,2-Dihydroxybenzene Oxyphenic acid Pyrocatechin Pyrocatechinic acid	Solid                      White                      Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Avoid inhalation. Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
 2.2 Formula: 1, 2-HOC<sub>6</sub>H<sub>4</sub>OH  
 2.3 IMO/UN Designation: Not listed  
 2.4 DOT ID No.: Not listed  
 2.5 CAS Registry No.: 120-80-9  
 2.6 NAERG Guide No.: Not listed  
 2.7 Standard Industrial Trade Classification: 51243

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator if required; rubber gloves, apron, and boots; face shield  
 3.2 **Symptoms Following Exposure:** Inhalation of dusts or mists may cause irritation of eyes, nose, and throat. Ingestion may cause convulsions and respiratory failure. Contact with eyes causes burns and possible permanent impairment of vision. Prolonged or repeated contact with skin may cause burn.  
 3.3 **Treatment of Exposure:** INHALATION: if ill effects occur, get medical attention. INGESTION: promptly give milk or plenty of water and induce vomiting; get medical attention promptly; no specific antidote known. EYES and SKIN: immediately flush with plenty of water for at least 15 min.; for eyes get medical attention promptly; remove and wash all contaminated clothing before reuse.  
 3.4 TLV-TWA: 5 ppm  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg (rat)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Causes tumors in mice  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 IDLH Value: Not listed.  
 3.14 OSHA PEL-TWA: Not listed.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** (liquid) 278°F O.C. 261°F C.C.  
 4.2 **Flammable Limits in Air:** Not pertinent (combustible solid)  
 4.3 **Fire Extinguishing Agents:** Dry chemical, "alcohol" foam, carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water and foam may be ineffective  
 4.5 **Special Hazards of Combustion**  
   **Products:** May form toxic fumes at high temperatures  
 4.6 **Behavior in Fire:** Currently not available  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** Not pertinent  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** Currently not available  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 14 ppm/48 hr/goldfish/TL<sub>m</sub>  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** CP-high purity, 99.3+%; XP-extremely high purity, 99.8+%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** 100 pounds  
 8.7 **EPA Pollution Category:** B  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
 9.2 **Molecular Weight:** 110.11  
 9.3 **Boiling Point at 1 atm:** 473.9°F = 245.5°C = 418.7°K  
 9.4 **Freezing Point:** 219.7°F = 104.3°C = 377.5°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 1.344 at 20°C (solid)  
 9.8 **Liquid Surface Tension:** Not pertinent  
 9.9 **Liquid Water Interfacial Tension:** Not pertinent  
 9.10 **Vapor (Gas) Specific Gravity:** 3.81  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** -11,200 Btu/lb = -6,220 cal/g = -260 X 10<sup>3</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** 49.40 cal/g  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# CATECHOL

CTC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	45.000	230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480	0.131 0.170 0.218 0.278 0.352 0.444 0.555 0.691 0.855 1.052 1.287 1.567 1.899 2.291 2.751 3.289 3.916 4.643 5.484 6.452 7.564 8.836 10.290 11.940 13.810 15.920	230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480	0.00195 0.00249 0.00315 0.00396 0.00495 0.00615 0.00760 0.00933 0.01139 0.01383 0.01672 0.02010 0.02406 0.02867 0.03401 0.04018 0.04727 0.05540 0.06468 0.07523 0.08721 0.10070 0.11600 0.13310 0.15230 0.17380		N O T  P E R T I N E N T

# 4-CHLORO-O-TOLUIDINE

CTD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Amino-5-chlorotoluene 5-Chloro-2-aminotoluene 4-Chloro-2-methylaniline Fast red TR base Red TR base	Solid  Gray to white  Weak fishy odor  Sinks in water. Freezing point is 77°F.
<b>KEEP PEOPLE AWAY.</b> Avoid inhalation. <b>AVOID CONTACT WITH SOLID AND DUST.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Stay upwind. Use water spray to "knock down" dust. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $2\text{-CH}_3\text{-4-ClC}_6\text{H}_4\text{NH}_2$
- 2.3 IMO/UN Designation: 6.1/2239
- 2.4 DOT ID No.: 2239
- 2.5 CAS Registry No.: 95-79-4
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51140

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; goggles; rubber gloves; protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation, ingestion, or skin contact causes bluish tint in fingernails, lips, and ears. Headache, drowsiness, and nausea also occur. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give oxygen if needed; get medical attention. EYES: flush with water for at least 15 min. SKIN: wash immediately with soap and water. INGESTION: induce vomiting; get medical attention.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral  $\text{LD}_{50}$  = 464 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Combustible solid
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and hydrochloric acid fumes may form.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 46.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 141.6
- 9.3 **Boiling Point at 1 atm:** 466°F = 241°C = 514°K
- 9.4 **Freezing Point:** 77°F = 25°C = 298°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** (est.) >1.1 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 4-CHLORO-O-TOLUIDINE

CTD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CHLORINE TRIFLUORIDE

CTF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> CTF	Liquefied compressed gas Greenish yellow liquid or colorless gas Strong sweetish odor  Sinks and may boil in water. Reacts violently with water to produce poisonous gas. Boiling point is 53°F.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear chemical protective suit with self-contained breathing apparatus. Evacuate area in case of large discharge. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. May explode on contact with combustibles. POISONOUS GASES ARE PRODUCED WHEN HEATED. Containers may explode in fire. Wear chemical protective suit with self-contained breathing apparatus. Combat fires from safe distance or protected location. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON ADJACENT FIRES. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR POISONOUS IF INHALED. Irritating to skin, eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{ClF}_3$   
2.3 IMO/UN Designation: 2/1749  
2.4 DOT ID No.: 1749  
2.5 CAS Registry No.: 7790-91-2  
2.6 NAERG Guide No.: 124  
2.7 Standard Industrial Trade Classification: 52241

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Neoprene gloves and protective clothing made of glass fiber and Teflon, including full hood; self-contained breathing apparatus with full face mask.
- 3.2 **Symptoms Following Exposure:** Inhalation causes extreme irritation of respiratory tract; pulmonary edema may result. Vapors are very irritating to eyes and skin; liquid causes severe burns.
- 3.3 **Treatment of Exposure:** Call physician at once after any exposure to this compound. INHALATION: remove victim to fresh air and keep him quiet; give artificial respiration if breathing has stopped; give oxygen; enforce rest for 24 hours. EYES: flush with water for at least 15 min.; get medical attention, but do not interrupt flushing for at least 10 min. SKIN: flush with water, then with 2-3% aqueous ammonia, then again with water; apply ice-cold pack of saturated Epsom salt or 70% ethyl alcohol.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 0.1 ppm  
3.7 **Toxicity by Ingestion:** Grade 4;  $\text{LD}_{50} < 50 \text{ mg/kg}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant, causes second-and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 20 ppm  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 0.1 ppm  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable, but may cause fire on contact with some materials.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water on adjacent fires unless well protected against hydrogen fluoride gas.
- 4.5 **Special Hazards of Combustion Products:** If released from container, fumes are toxic and irritating.
- 4.6 **Behavior in Fire:** If released from container, can increase the intensity of fire. Containers may explode.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts explosively with water, evolving hydrogen fluoride (hydrofluoric acid) and chlorine.
- 5.2 **Reactivity with Common Materials:** Causes ignition of all combustible materials and even sand or concrete. Very similar to fluorine gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: (3)  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison Gas
- 8.2 **49 CFR Class:** 2.3
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 92.5
- 9.3 **Boiling Point at 1 atm:** 53°F = 11.6°C = 284.8°K
- 9.4 **Freezing Point:** -105°F = -76.1°C = 197.1°K
- 9.5 **Critical Temperature:** 307.4°F = 153°C = 426.2°K
- 9.6 **Critical Pressure:** 837 psia = 56.9 atm = 5.77 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.85 at 11°C (liquid)
- 9.8 **Liquid Surface Tension:** 26.6 dynes/cm = 0.0266 N/m at 0°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 3.2
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.2832
- 9.12 **Latent Heat of Vaporization:** 128 Btu/lb = 71.2 cal/g = 2.98 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CHLORINE TRIFLUORIDE

CTF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	117.400	-75	0.291	33	1.048	16	0.595
40	116.900	-70	0.291	34	1.048	18	0.588
45	116.299	-65	0.292	35	1.048	20	0.580
50	115.799	-60	0.292	36	1.048	22	0.573
		-55	0.293	37	1.048	24	0.566
		-50	0.293	38	1.048	26	0.559
		-45	0.294	39	1.048	28	0.553
		-40	0.294	40	1.048	30	0.546
		-35	0.295	41	1.048	32	0.539
		-30	0.295	42	1.048	34	0.533
		-25	0.296	43	1.048	36	0.527
		-20	0.296	44	1.048	38	0.521
		-15	0.297	45	1.048	40	0.515
		-10	0.298	46	1.048	42	0.509
		-5	0.298	47	1.048	44	0.503
		0	0.299	48	1.048	46	0.497
		5	0.299	49	1.048	48	0.492
		10	0.300	50	1.048	50	0.486
		15	0.300	51	1.048	52	0.481
		20	0.301	52	1.048		
		25	0.301				
		30	0.302				
		35	0.302				
		40	0.303				
		45	0.303				
		50	0.304				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	-50	0.622	-50	0.01308	-5	0.097
	E	-45	0.757	-45	0.01574	0	0.097
	A	-40	0.917	-40	0.01883	5	0.097
	C	-35	1.105	-35	0.02242	10	0.097
	T	-30	1.324	-30	0.02655	15	0.097
	S	-25	1.579	-25	0.03130	20	0.097
		-20	1.873	-20	0.03672	25	0.097
		-15	2.213	-15	0.04288	30	0.097
		-10	2.602	-10	0.04987	35	0.097
		-5	3.047	-5	0.05776	40	0.097
		0	3.554	0	0.06663	45	0.097
		5	4.129	5	0.07657	50	0.097
		10	4.778	10	0.08767	55	0.097
		15	5.510	15	0.10000	60	0.097
		20	6.332	20	0.11370	65	0.097
		25	7.251	25	0.12890	70	0.097
		30	8.277	30	0.14570	75	0.097
		35	9.419	35	0.16410	80	0.097
		40	10.690	40	0.18430		
		45	12.090	45	0.20640		
		50	13.630	50	0.23050		
		55	15.340	55	0.25680		
		60	17.210	60	0.28530		
		65	19.260	65	0.31630		
		70	21.500	70	0.34980		
		75	23.940	75	0.38590		

# M-CHLOROTOLUENE

CTM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Chloro-3-methylbenzene 3-Chloro-1-methylbenzene 3-Chlorotoluene m-Tolyl chloride	Liquid  Sinks in water.	Colorless  	Pungent  
<b>Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>			
<b>Fire</b>	Combustible. Poisonous gases may be produced in fire. Containers may explode in fire. Flash back along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be harmful if inhaled or absorbed through the skin. Irritating to eyes, skin, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed or absorbed through skin. Irritating to skin and eyes. IF IN EYES OR ON SKIN, flush with running water for at least 15 min.; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain undissolved material  
Dilute and disperse dissolved material  
Collection Systems: Pump; Dredge  
Chemical and Physical Treatment:  
Absorb

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 36; Halogenated hydrocarbons  
2.2 **Formula:** C<sub>7</sub>H<sub>7</sub>Cl  
2.3 **IMO/UN Designation:** 3.3/2238  
2.4 **DOT ID No.:** 2238  
2.5 **CAS Registry No.:** 108-41-8  
2.6 **NAERG Guide No.:** 130  
2.7 **Standard Industrial Trade Classification:** 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.  
3.2 **Symptoms Following Exposure:** Inhalation causes upper respiratory irritation. Irritating to skin and eyes. May be absorbed through the skin. Prolonged exposure may result in systemic toxic effects. Harmful if swallowed.  
3.3 **Treatment of Exposure:** INHALATION: Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If victim is conscious, have victim drink water or milk. DO NOT INDUCE VOMITING. If victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Prolonged and repeated vapor exposure may result in systemic toxic effects.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 123°F. C.C.  
4.2 **Flammable Limits in Air:** 1.36% (LFL) (calculated)  
4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** May contain toxic chloride fumes.  
4.6 **Behavior in Fire:** May produce toxic and irritating chloride fumes.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 18 ppm/7d/guppy LD<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: Z  
Damage to living resources: 2  
Human Oral hazard: (1)  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Not listed  
7.4 **Venting:** Not pertinent  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 126.59  
9.3 **Boiling Point at 1 atm:** 323.6°F = 162.2°C = 435.2°K  
9.4 **Freezing Point:** -54°F = -47.8°C = 225.4°K  
9.5 **Critical Temperature:** 730°F = 388°C = 161°K (est.)  
9.6 **Critical Pressure:** 567 psia = 38.6 atm = 3.91 MN/m<sup>2</sup> (est.)  
9.7 **Specific Gravity:** 1.0722 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 143 Btu/lb = 79.6 cal/g = 3.3 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# M-CHLOROTOLUENE

CTM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	66.930		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	50 75 100 125 150 175 200 225 250 275 300	0.020 0.077 0.197 0.409 0.744 1.233 1.910 2.809 3.967 5.422 7.210	50 75 100 125 150 175 200 225 250 275 300	0.00049 0.00169 0.00407 0.00803 0.01400 0.02239 0.03363 0.04815 0.06637 0.08874 0.11568		C U R R E N T L Y  N O T  A V A I L A B L E

# O-CHLOROTOLUENE

CTO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzene, 1-chloro-2-methyl 2-Chloro-1-methylbenzene 2-Chlorotoluene 1-Methyl-2-chlorobenzene o-Tolyl chloride	Liquid  Sinks in water.	Colorless	Aromatic
<b>Keep people away. Avoid contact with liquid and vapor.</b> Avoid inhalation. Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	COMBUSTIBLE. Poisonous gases may be produced in fire. Containers may explode in fire. Flash back along vapor trail may occur. Vapor may explode if ignited in enclosed area. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Cool exposed containers with water from the side until well after fire is out.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be harmful if inhaled or absorbed through the skin. Irritating to eyes, skin, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed or absorbed through the skin. IF IN EYES OR ON SKIN, flush with running water for at least 15 min.; hold eyelids open if necessary. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. Remove and isolate contaminated clothing and shoes at the site.		
<b>Water Pollution</b>	Effects of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain undissolved material  
Dilute and disperse dissolved material  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 36; Halogenated hydrocarbons  
2.2 Formula: CH<sub>3</sub>CH<sub>2</sub>Cl  
2.3 IMO/UN Designation: 3.3/2238  
2.4 DOT ID No.: 2238  
2.5 CAS Registry No.: 95-49-8  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.  
3.2 **Symptoms Following Exposure:** Inhalation of vapor may cause respiratory irritation. Prolonged and repeated vapor exposures may produce systemic toxic effects.  
3.3 **Treatment of Exposure:** INHALATION: Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If victim is conscious, have victim drink water or milk. DO NOT INDUCE VOMITING. If victim is unconscious or having convulsions, do nothing except keep victim warm.  
3.4 **TLV-TWA:** 50 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = .5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Prolonged and repeated vapor exposure may produce systemic effects.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 126°F O.C. 117°F C.C.  
4.2 **Flammable Limits in Air:** 1.36% (LFL) calculated  
4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** May contain toxic chloride fumes.  
4.6 **Behavior in Fire:** Container may explode in heat of fire. Vapor may travel to a source of ignition and flashback. Vapor explosion hazard indoors, outdoors or in sewer. Toxic chloride fumes may be produced.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Reacts with oxidizing agents.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Not listed  
7.4 **Venting:** Not pertinent  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 126.59  
9.3 **Boiling Point at 1 atm:** 318.6°F = 159.2°C = 432.4°K  
9.4 **Freezing Point:** -31.2°F = -35.1°C = 238.1°K  
9.5 **Critical Temperature:** 719°F = 382°C = 655°K (est.)  
9.6 **Critical Pressure:** 567 psia = 38.6 atm = 3.91 MN/m<sup>2</sup> (est.)  
9.7 **Specific Gravity:** 1.0825 at 20°C  
9.8 **Liquid Surface Tension:** 33440 dynes/cm = 0.03344 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 146 Btu/lb = 81.2 cal/g = 3.4x10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# O-CHLOROTOLUENE

CTO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	67.570		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	50 75 100 125 150 175 200 225 250 275 300	0.019 0.075 0.196 0.413 0.759 1.270 1.985 2.942 4.183 5.753 7.694	25 50 75 100 125 150 175 200 225 275 300	0.07027 0.00046 0.00164 0.00403 0.00808 0.01427 0.02309 0.03502 0.05058 0.09462 0.12414		C U R R E N T L Y  N O T  A V A I L A B L E

# COAL TAR PITCH

CTP

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Viscous liquid

Black

Aromatic solvent

Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR.  
Shut off ignition sources and call fire department.  
Notify local health and pollution control agencies.  
Wear approved respirator, chemical resistant gloves, and safety goggles.

### Fire

**COMBUSTIBLE.**  
Use self-contained breathing apparatus in confined areas.  
Extinguish with CO<sub>2</sub>, alcohol foam, or dry chemical.  
Use water to cool exposed containers.

### Exposure

**CALL FOR MEDICAL AID.**  
Remove contaminated clothing and shoes.  
If IN EYES, hold eyelids open and flush with plenty of water.  
Remove from skin with vegetable or mineral oil.

### Water Pollution

Effects of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 33; Miscellaneous Hydrocarbon Mixtures  
**2.2 Formula:** Not pertinent. (Mixture)  
**2.3 IMO/UN Designation:** Not listed.  
**2.4 DOT ID No.:** 1136  
**2.5 CAS Registry No.:** 65996-92-1 (polycyclic hydrocarbons)  
**2.6 NAERG Guide No.:** 128  
**2.7 Standard Industrial Trade Classification:** 33530

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Wear approved organic vapor respirator, chemical resistant gloves, and safety goggles.  
**3.2 Symptoms Following Exposure:** EYES: Redness, irritation, blurred vision. INHALATION: Nasal and respiratory irritation, fatigue, dizziness, weakness, headache, and possible cardiovascular collapse. INGESTION: Gastrointestinal irritation, nausea, vomiting, and diarrhea. SKIN: Can cause severe irritation, which, when accentuated by sunlight, may result in phototoxic burns.  
**3.3 Treatment of Exposure:** CALL FOR MEDICAL AID. EYES: Flush with clean water for at least 15 minutes. INGESTION: No treatment normally required. SKIN: Cool hot material with cold water. Remove with vegetable or mineral oil.  
**3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** 0.2 mg/m<sup>3</sup> as coal tar pitch volatiles  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Currently not available  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** 80 mg/m<sup>3</sup> as coal tar pitch volatiles  
**3.14 OSHA PEL-TWA:** 0.2 mg/m<sup>3</sup> as coal tar pitch volatiles  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point:** >450°C  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Water spray or foams. Avoid solid water streams to prevent frothing.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent.  
**4.5 Special Hazards of Combustion Products:** Toxic gases, such as carbon monoxide, may be produced.  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction.  
**5.2 Reactivity with Common Materials:** No reaction.  
**5.3 Stability During Transport:** Stable.  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent.  
**5.5 Polymerization:** Will not polymerize.  
**5.6 Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: -  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Technical grades.  
**7.2 Storage Temperature:** Ambient.  
**7.3 Inert Atmosphere:** No requirement.  
**7.4 Venting:** Pressure vacuum valve.  
**7.5 IMO Pollution Category:** D  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid  
**8.2 49 CFR Class:** 3  
**8.3 49 CFR Package Group:** III  
**8.4 Marine Pollutant:** Yes  
**8.5 NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** Mixture  
**9.3 Boiling Point at 1 atm:** >150°F = >65.6°C = >338.6°K  
**9.4 Freezing Point:** Currently not available  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** >1.1  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** >1.0  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Not pertinent.  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# COAL TAR PITCH

CTP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# COPPER TARTRATE

CTT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Tartaric acid, copper salt	Solid powder Green to blue Odorless
Sinks and slowly mixes with water.	
Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Harmful if swallowed. Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Dredge  
Cover with organic sulfur containing compounds

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CuC}_4\text{H}_4\text{O}_6$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 9111  
2.5 CAS Registry No.: 815-82-7  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 51391

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Currently not available  
3.2 Symptoms Following Exposure: INHALATION: Inhalation of dust may cause nasal congestion. EYES: May cause conjunctivitis and edema of eyelids. SKIN: May irritate skin. INGESTION: Vomiting is caused by local irritant and astringent action of ionic copper on stomach and bowel.  
3.3 Treatment of Exposure: Call a physician. EYES: flush with water. SKIN: Wash with water. INGESTION: Induce vomiting and administer gastric lavage. Give saline cathartic.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Copper poisoning in animals leads to injury of liver, kidneys, and spleen.  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: 100 mg  $\text{Cu}/\text{m}^3$  (dust, mist, fumes)  
3.14 OSHA PEL-TWA: 0.1 mg/ $\text{m}^3$  as copper  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Currently not available  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Currently not available  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Currently not available  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Currently not available  
5.4 Neutralizing Agents for Acids and Caustics: Currently not available  
5.5 Polymerization: Currently not available  
5.6 Inhibitor of Polymerization: Currently not available

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
The toxicity varies significantly, not only with species, but also with physical and chemical characteristics of the water. Concentrates from 0.015 to 3.0 mg/l cu is toxic to many fish, crustacean, mollusks, insects, and plankton.  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 211.61; 265.66 trihydrate  
9.3 Boiling Point at 1 atm: Trihydrate decomposes on heating  
9.4 Freezing Point: Currently not available  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: >1  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

NOTES

# COPPER TARTRATE

CTT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
60 70 80 90 100 110 120 130 140 150 160 170 180	0.021 0.030 0.040 0.050 0.059 0.069 0.078 0.088 0.097 0.107 0.116 0.126 0.135		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# COPPER FORMATE

CUF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cupric diformate Tubercuprose	Solid crystalline powder  Blue  Sinks and mixes with water.
Keep people away. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber gloves. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST or SOLID Irritating to skin, eyes, and nose. Harmful if swallowed. Move to fresh air. IF IN EYES, hold eyelids open and flush with plenty of water. Flush affected areas with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain undissolved material  
Dilute and disperse dissolved material  
Collection Systems: Dredge  
Cover with organic sulfur containing compounds

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** Cu(HCOO)<sub>2</sub>  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 544-19-4  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51374

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** NIOSH approved respirator if needed, rubberized fabric gloves, chemical dust goggles.  
3.2 **Symptoms Following Exposure:** INHALATION: May cause nasal congestion. EYES: May cause conjunctivitis. SKIN: Irritation. INGESTION: Irritation.  
3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from exposure. EYES: Flush with copious amounts of water. SKIN: Wash with soap and water. INGESTION: Dilute with water or milk, induce vomiting, or remove by gastric lavage.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 100 mg Cu/m<sup>3</sup> (dust, mist, fumes)  
3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as copper  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** Currently not available  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 153.58  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.831 at 15° to 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# COPPER FORMATE

CUF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
70	12.500		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# CUMENE

CUM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cumol Isopropylbenzene		Watery liquid	Colorless	Gasoline-like odor
		Floats on water.		
Keep people away. Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.				
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, foam or carbon dioxide. Cool exposed containers with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 32; Aromatic  
Hydrocarbon  
2.2 **Formula:** C<sub>9</sub>H<sub>8</sub>CH(CH<sub>3</sub>)<sub>2</sub>  
2.3 **IMO/UN Designation:** 3.3/1918  
2.4 **DOT ID No.:** 1918  
2.5 **CAS Registry No.:** 98-82-8  
2.6 **NAERG Guide No.:** 131  
2.7 **Standard Industrial Trade Classification:**  
51127

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** As necessary to avoid skin exposure. If concentration in air is greater than 50 ppm, use self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** Narcotic action with long-lasting effects; depressant to central nervous system.
- 3.3 **Treatment of Exposure:** INHALATION: move patient immediately to fresh air; administer artificial respiration or oxygen if necessary; seek medical attention. SKIN OR EYES: wash exposed skin surfaces thoroughly; flush eyes thoroughly with water for 15 min.
- 3.4 **TLV-TWA:** 50 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None reported
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 1.2 ppm
- 3.13 **IDLH Value:** 900 ppm
- 3.14 **OSHA PEL-TWA:** 50 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 96°F C.C.
- 4.2 **Flammable Limits in Air:** 0.9%-6.5%
- 4.3 **Fire Extinguishing Agents:** Foam, water, carbon dioxide or dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 797°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 5.0 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
110 ppm/24 hr/Brine Shrimp/TL<sub>m</sub>
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 40% of theoretical in 5 days, fresh water
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research grade; pure grade; technical grade
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** A
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** U055
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 120.19
- 9.3 **Boiling Point at 1 atm:** 306.3°F = 152.4°C = 425.6°K
- 9.4 **Freezing Point:** -140.9°F = -96.1°C = 177.1°K
- 9.5 **Critical Temperature:** 676.2°F = 357.9°C = 631.1°K
- 9.6 **Critical Pressure:** 465.5 psia = 31.67 atm = 3.208 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.866 at 15°C (liquid)
- 9.8 **Liquid Surface Tension:** 28.2 dynes/cm = 0.0282 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** 54.6 dynes/cm = 0.0546 N/m at 22.7°
- 9.10 **Vapor (Gas) Specific Gravity:** 4.1
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.059
- 9.12 **Latent Heat of Vaporization:** 134 Btu/lb = 74.6 cal/g = 3.12 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -17,710 Btu/lb = -9840 cal/g = -412.0 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.5 psia

### NOTES



# CUMENE

CUM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	54.620	20	0.397	30	0.894	0	1.484
50	54.310	30	0.399	40	0.886	5	1.408
60	54.010	40	0.402	50	0.878	10	1.337
70	53.700	50	0.405	60	0.871	15	1.272
80	53.390	60	0.408	70	0.863	20	1.210
90	53.080	70	0.411	80	0.856	25	1.153
100	52.770	80	0.413	90	0.848	30	1.100
110	52.460	90	0.416	100	0.840	35	1.050
120	52.150	100	0.419	110	0.833	40	1.003
130	51.840	110	0.422	120	0.825	45	0.959
140	51.540	120	0.424	130	0.818	50	0.918
150	51.230	130	0.427	140	0.810	55	0.880
160	50.920	140	0.430	150	0.803	60	0.843
170	50.610	150	0.433	160	0.795	65	0.809
180	50.300	160	0.436	170	0.787	70	0.777
190	49.990	170	0.438	180	0.780	75	0.747
200	49.680			190	0.772	80	0.718
210	49.380			200	0.765	85	0.691

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	20	0.095	20	0.00222	0	0.256
	N	30	0.119	30	0.00273	25	0.271
	S	40	0.149	40	0.00333	50	0.286
	O	50	0.183	50	0.00403	75	0.300
	L	60	0.224	60	0.00483	100	0.315
	U	70	0.272	70	0.00576	125	0.329
	B	80	0.328	80	0.00681	150	0.342
	L	90	0.393	90	0.00801	175	0.356
	E	100	0.468	100	0.00936	200	0.369
		110	0.553	110	0.01087	225	0.382
		120	0.650	120	0.01256	250	0.394
		130	0.760	130	0.01444	275	0.407
		140	0.884	140	0.01651	300	0.419
		150	1.024	150	0.01880	325	0.431
		160	1.179	160	0.02131	350	0.442
		170	1.352	170	0.02405	375	0.454
						400	0.465
						425	0.476
						450	0.486
						475	0.496
						500	0.506
						525	0.516
						550	0.526
						575	0.535
						600	0.544

# CREOSOTE (WOOD)

CWD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Creosote	Liquid	Brown to black	Creosote or tarry odor
<b>Keep people away.</b> Wear chemical protective clothing, gloves, goggles and use approved respirator. Extinguish all ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Closed containers may explode when exposed to extreme heat. Wear full protective clothing with self-contained breathing apparatus. Extinguish with dry chemicals, alcohol foam or carbon dioxide. Use water spray to cool exposed containers.		
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Chemical and Physical Treatment:  
Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 21; Phenols, cresols  
2.2 **Formula:** Not pertinent. (Mixture)  
2.3 **IMO/UN Designation:** 9/1993  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** 8001-58-9  
2.6 **NAERG Guide No.:** Not listed.  
2.7 **Standard Industrial Trade Classification:** Currently not available

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear chemical protective clothing, rubber gloves. Use chemical safety goggles and/or face shield to protect the eyes. Barrier creams may be to prevent skin contact. Use approved respirator to protect against vapor.
- 3.2 **Symptoms Following Exposure:** Vapors cause severe irritation of skin, nose and throat. Inhalation may damage nervous system and cause cardiovascular collapse. Liquid causes severe burns of eyes and reddening and itching of skin. Prolonged contact with skin can cause burns. Ingestion causes gastrointestinal disturbances and abdominal pain.
- 3.3 **Treatment of Exposure:** Call for medical aid. INHALATION: Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush immediately with plenty of water for at least 15 min. SKIN: Flush with water. INGESTION: Do NOT induce vomiting.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second- degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 200°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Irritating and hazardous gases, such as carbon monoxide, may be produced in fire.  
4.6 **Behavior in Fire:** Containers may explode when exposed to extreme heat.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Open.  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 1 pound  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** U051  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Mixture  
9.3 **Boiling Point at 1 atm:** 335°F = 168.3°C = 441.3°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** >1.0  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CREOSOTE (WOOD)

CWD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# CARBON OXYFLUORIDE

CXY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carbonic difluoride Carbonyl difluoride Carbonyl fluoride Fluophosgene Fluoroformyl fluoride Fluorophosgene	Liquefied compressed gas Colorless gas or light yellow liquid Pungent Odor
<b>Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear goggles and self-contained breathing apparatus. Evacuate area in case of large discharge. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus. Cool exposed containers and protect men effecting shutoff with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Effects may be delayed. Move to fresh air. If breathing has stopped, give artificial respiration (but NOT mouth-to-mouth). If breathing is difficult, give oxygen. Maintain absolute rest until medical aid arrives.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: CF <sub>2</sub> O 2.3 IMO/UN Designation: 2.3/2417 2.4 DOT ID No.: 2417 2.5 CAS Registry No.: 353-50-4 2.6 NAERG Guide No.: 125 2.7 Standard Industrial Trade Classification: 51626
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Approved respirator; protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Irritates lungs, causing delayed pulmonary edema. Slight gassing produces dryness or burning sensation in the throat, numbness, pain in the chest, bronchitis, and shortness of breath. 3.3 <b>Treatment of Exposure:</b> INHALATION: Remove victim from contaminated area; enforce absolute rest; call a doctor. 3.4 TLV-TWA: 2 ppm 3.5 TLV-STEL: 5 ppm 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Not pertinent 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Severe delayed pulmonary edema. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 3.11 <b>Liquid or Solid Characteristics:</b> Severe irritant to all tissues. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Water to cool containers
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic gas is generated when heated.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Decomposes, but not vigorously
- 5.2 **Reactivity with Common Materials:**  
None
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Can be absorbed in caustic soda solution. One ton of Carbon Oxyfluoride requires 2,480 lbs. of caustic soda dissolved in 1,000 gal of water.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 100%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison Gas
- 8.2 49 CFR Class: 2.3
- 8.3 49 CFR Package Group: Not pertinent.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: U033
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Gas
- 9.2 Molecular Weight: 66.01
- 9.3 Boiling Point at 1 atm: -117°F = -83°C = 190°K
- 9.4 Freezing Point: -173°F = -114°C = 159°K
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 1.139 at -114°C
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: 2.28
- 9.11 Ratio of Specific Heats of Vapor (Gas):  
Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Currently not available
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# CARBON OXYFLUORIDE

CXY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	7		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.152 0.155 0.159 0.162 0.165 0.168 0.171 0.174 0.177 0.180 0.183 0.186 0.189 0.192 0.195 0.198 0.201 0.204 0.207 0.210 0.213 0.216 0.219 0.222 0.226

# CYANOACETIC ACID

CYA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cyanacetic acid Malonic mononitrile	Liquid  Yellowish brown  Unpleasant odor  Sinks and mixes with water.
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Shut off ignition sources. Call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with water, dry chemicals, foam or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CNCH2COOH  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 1935  
2.5 CAS Registry No.: 372-09-8  
2.6 NAERG Guide No.: 157  
2.7 Standard Industrial Trade Classification: 51484

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Contact irritates eyes and may irritate skin.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water; get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
Not pertinent  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and toxic and flammable acetonitrile vapors may form in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 98+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0 3
Flammability (Red).....	1 1
Instability (Yellow).....	0 0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 85.06  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** 151°F = 66°C = 339°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** > 1.1 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -6,300 Btu/lb = -3,500 cal/g = -146 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# CYANOACETIC ACID

CYA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CYCLOHEXYL ACETATE

CYC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, cyclohexyl ester Cyclohexanyl acetate UN 2243 (DOT)		Liquid	Colorless
Keep people away. Avoid inhalation. Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Flashback along vapor trail may occur. Water may be ineffective on fire. Wear self-contained breathing apparatus and protective clothing. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May cause irritation. Move to fresh air. If victim is not breathing, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Esters  
 2.2 Formula: CH<sub>3</sub>CO<sub>2</sub>C<sub>6</sub>H<sub>11</sub>  
 2.3 IMO/UN Designation: 3.3/2243  
 2.4 DOT ID No.: 2243  
 2.5 CAS Registry No.: 622-45-7  
 2.6 NAERG Guide No.: 130  
 2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion, or skin absorption. Causes eye and skin irritation.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush immediately with copious amounts of water for at least 15 minutes. SKIN: Wash immediately with soap and water with copious amounts of water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 6.73 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 136°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam, or water spray.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Emits toxic fumes under fire conditions. Vapor may travel considerable distance to a source of ignition and flash back.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Currently not available
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: (3)  
 Human Oral hazard: 0  
 Human Contact hazard: II  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** (B)
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable Liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 142.2
- 9.3 **Boiling Point at 1 atm:** 350°F = 177°C = 450°K
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.966
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 4.9
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# CYCLOHEXYL ACETATE

CYC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	203 221 239 257 275 293 311 329 342	1.047 1.505 2.290 3.282 4.619 6.389 8.698 11.667 14.213		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.226 0.240 0.255 0.268 0.282 0.296 0.309 0.322 0.335 0.347 0.360 0.372 0.384 0.395 0.407 0.418 0.429 0.440 0.451 0.461 0.471 0.481 0.491 0.501 0.510

## CYCLOHEPTANE

CYE

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms		
UN 2241 (DOT)	Liquid	Colorless
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Evacuate area.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>		
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective on fire. Wear self-contained breathing apparatus and protective clothing. Extinguish with foam, dry chemicals or carbon dioxide. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, nausea, vomiting or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	The effect of low concentration on aquatic life is not known. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.	

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn where legal  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 31; Paraffins  
2.2 Formula: C<sub>7</sub>H<sub>14</sub>  
2.3 IMO/UN Designation: 3.2/2241  
2.4 DOT ID No.: 2241  
2.5 CAS Registry No.: 291-64-5  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51129

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion, or skin absorption. May cause eye and skin irritation.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with copious amounts of water for at least 15 minutes. SKIN: Flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 43°F
- 4.2 **Flammable Limits in Air:** 1.1% - 6.7%
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Vapor may travel considerable distance to a source of ignition and flash back. Container explosion may occur under fire conditions. Forms explosive mixtures in air.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** No reaction.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Data not pertinent.
- 5.5 **Polymerization:** Will not occur.
- 5.6 **Inhibitor of Polymerization:** Data not pertinent.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: (1)  
Human Contact hazard: II  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** (C)
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable Liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid.
- 9.2 **Molecular Weight:** 98.19
- 9.3 **Boiling Point at 1 atm:** 245.3°F = 118.5°C = 391.7°K
- 9.4 **Freezing Point:** 10.4°F = -12°C = 261.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.811
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 3.39
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.851 psia

## NOTES

# CYCLOHEPTANE

CYE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	100 154 172 190 208 226 244 262 280 298 316	0.851 2.867 4.136 5.824 8.024 10.839 14.380 18.768 24.130 30.589 38.310		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.365 0.380 0.395 0.410 0.425 0.439 0.453 0.467 0.481 0.494 0.507 0.520 0.533 0.545 0.557 0.569 0.581 0.593 0.604 0.615 0.626 0.636 0.647 0.657 0.667

# CYANOGEN

CYG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dicyan Dicyanogen Ethane dinitrile Oxalic acid dinitrile Oxalotrile	<b>Gas</b>  <b>Colorless</b>  <b>Almond Odor</b>  Floats and boils on water. Poisonous, flammable visible vapor cloud is produced.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Evacuate area in case of large discharge. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Let fire burn. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration (but not mouth-to-mouth).  LIQUID POISONOUS IF SWALLOWED. Will cause frostbite. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: (CN) <sub>2</sub> 2.3 IMO/UN Designation: 2/1026 2.4 DOT ID No.: 1026 2.5 CAS Registry No.: 460-19-5 2.6 NAERG Guide No.: 119 2.7 Standard Industrial Trade Classification: 51484
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus; rubber gloves; rubber protective clothing; rubber-soled shoes. 3.2 <b>Symptoms Following Exposure:</b> Vapor irritates eyes and causes giddiness, headache, fatigue, and nausea if inhaled. 3.3 <b>Treatment of Exposure:</b> In general, treatment is similar to that used following exposure to hydrogen cyanide. INHALATION: move victim to fresh air and have him lie down; do not permit him to exert himself; remove contaminated clothing but keep patient covered and comfortably warm; summon a physician; break an amyl nitrite pearl in a cloth and hold it lightly under the victim's nose for 15 seconds; repeat five times at about 15-sec. intervals; use artificial respiration if breathing has stopped. EYES: flush with water for at least 15 min. 3.4 TLV-TWA: 10 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Currently not available 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Flammable gas
- 4.2 **Flammable Limits in Air:** 6.6%-43%
- 4.3 **Fire Extinguishing Agents:** Let fire burn, shut off flow of gas, cool exposed areas with water.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Unburned vapors are highly toxic.
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode in fire, releasing the highly toxic gas.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 19.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 4.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction, but water provides heat to vaporize liquid cyanogen.
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98.5%
- 7.2 **Storage Temperature:** Cool ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Store containers in well ventilated area
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison gas
- 8.2 **49 CFR Class:** 2.3
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 4              |
| Instability (Yellow)..... | 2              |
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** P031
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 52.0
- 9.3 **Boiling Point at 1 atm:** -6.1°F = -21.1°C = 252.1°K
- 9.4 **Freezing Point:** -18.2°F = -27.9°C = 245.3°K
- 9.5 **Critical Temperature:** 259.9°F = 126.6°C = 399.8°K
- 9.6 **Critical Pressure:** 857 psia = 58.2 atm = 5.91 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.954 at -21°C (liquid)
- 9.8 **Liquid Surface Tension:** 22 dynes/cm = 0.022 N/m at -21°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 1.8
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.205 at 25°C
- 9.12 **Latent Heat of Vaporization:** 200 Btu/lb = 111 cal/g = 4.65 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -9,059 Btu/lb = -5,033 cal/g = -210.6 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 2,520 Btu/lb = 1,400 cal/g = 58.5 X 10<sup>3</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# CYANOGEN

CYG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-18	59.970	-18	0.300	-18	0.967	-18	0.447
-17	59.940	-17	0.300	-17	0.967	-17	0.443
-16	59.900	-16	0.300	-16	0.967	-16	0.439
-15	59.870	-15	0.300	-15	0.967	-15	0.435
-14	59.840	-14	0.300	-14	0.967	-14	0.431
-13	59.801	-13	0.300	-13	0.967	-13	0.427
-12	59.770	-12	0.300	-12	0.967	-12	0.423
-11	59.730	-11	0.300	-11	0.967	-11	0.420
-10	59.700	-10	0.300	-10	0.967	-10	0.416
-9	59.660	-9	0.300	-9	0.967	-9	0.412
-8	59.630	-8	0.300	-8	0.967	-8	0.409
-7	59.590	-7	0.300	-7	0.967	-7	0.405

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		-10	13.260	-10	0.14290	30	0.252
		-5	15.060	-5	0.16040	35	0.253
		0	17.050	0	0.17960	40	0.254
		5	19.250	5	0.20070	45	0.255
		10	21.680	10	0.22360	50	0.256
		15	24.360	15	0.24860	55	0.256
		20	27.300	20	0.27570	60	0.257
		25	30.520	25	0.30510	65	0.258
		30	34.050	30	0.33680	70	0.259
		35	37.900	35	0.37120	75	0.260
		40	42.100	40	0.40810	80	0.260
		45	46.660	45	0.44790	85	0.261
		50	51.610	50	0.49060	90	0.262
		55	56.980	55	0.53630	95	0.263
		60	62.790	60	0.58530	100	0.264
		65	69.059	65	0.63760	105	0.265
		70	75.820	70	0.69340	110	0.265
		75	83.089	75	0.75280	115	0.266
		80	90.910	80	0.81610	120	0.267
		85	99.299	85	0.88320	125	0.268
						130	0.269
						135	0.269
						140	0.270
						145	0.271
						150	0.272

## CYCLOPENTANE

CYP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Pentamethylene	Watery liquid Colorless Mild, sweet odor
Floats on water. Flammable, irritating vapor is produced.	
Keep people away. Avoid inhalation. Shut off ignition sources. Call fire department. Evacuate area in case of large discharge. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, nausea, vomiting, difficult breathing, or loss of consciousness. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>5</sub>H<sub>10</sub>  
2.3 IMO/UN Designation: 3.1/1146  
2.4 DOT ID No.: 1146  
2.5 CAS Registry No.: 287-92-3  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51129

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Hydrocarbon canister, supplied-air, or hose mask; rubber or plastic gloves; chemical goggles or face shield.
- 3.2 **Symptoms Following Exposure:** Inhalation causes dizziness, nausea, and vomiting; concentrated vapor may cause unconsciousness and collapse. Vapor causes slight smarting of eyes. Contact with liquid causes irritation of eyes and may irritate skin if allowed to remain. Ingestion causes irritation of stomach. Aspiration produces severe lung irritation and rapidly developing pulmonary edema; central nervous system excitement followed by depression.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; if breathing stops, apply artificial respiration and administer oxygen. EYES: flush with water for at least 15 min.; call a physician. SKIN: flush well with water, then wash with soap and water. INGESTION: do NOT induce vomiting; guard against aspiration into lungs. ASPIRATION: enforced bed rest; give oxygen; get medical attention.
- 3.4 **TLV-TWA:** 600 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
< 20°F C.C.
- 4.2 **Flammable Limits in Air:** (approx.) 1.1%-8.7%
- 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode.
- 4.7 **Auto Ignition Temperature:** 682°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 7.9 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: (1)  
Human Contact hazard: I  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; 60% (remainder consists of hydrocarbons of similar boiling point); Research: 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** (C)
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 70.1
- 9.3 **Boiling Point at 1 atm:** 120.7°F = 49.3°C = 322.5°K
- 9.4 **Freezing Point:** -137.0°F = -93.9°C = -179.3°K
- 9.5 **Critical Temperature:** 461.5°F = 238.6°C = 511.8°K
- 9.6 **Critical Pressure:** 654 psia = 44.4 atm = 4.51 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.74 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 23 dynes/cm = 0.023 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 28 dynes/cm = 0.028 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** 2.4
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1217
- 9.12 **Latent Heat of Vaporization:** 170 Btu/lb = 94 cal/g = 3.9 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -19,900 Btu/lb = -11,110 cal/g = -465 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 2.07 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# CYCLOPENTANE

CYP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	47.340	35	0.409	64	0.920	35	0.546
40	47.160	40	0.411	66	0.918	40	0.526
45	46.990	45	0.414	68	0.915	45	0.508
50	46.820	50	0.417	70	0.913	50	0.490
55	46.640	55	0.420	72	0.910	55	0.473
60	46.470	60	0.423	74	0.907	60	0.457
65	46.300	65	0.425	76	0.905	65	0.442
70	46.120	70	0.428	78	0.902	70	0.427
75	45.950	75	0.431	80	0.900	75	0.414
80	45.780	80	0.434	82	0.897	80	0.401
85	45.600	85	0.436	84	0.894	85	0.389
90	45.430	90	0.439	86	0.892	90	0.377
95	45.260	95	0.442	88	0.889	95	0.366
100	45.080	100	0.445	90	0.886	100	0.355
		105	0.448	92	0.884	105	0.345
		110	0.450	94	0.881	110	0.335
		115	0.453	96	0.879	115	0.326
		120	0.456	98	0.876	120	0.317
				100	0.873		
				102	0.871		
				104	0.868		
				106	0.866		
				108	0.863		
				110	0.860		
				112	0.858		
				114	0.855		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	0	0.963	0	0.01368	0	0.218
	N	5	1.108	5	0.01558	20	0.231
	S	10	1.272	10	0.01769	40	0.243
	O	15	1.455	15	0.02002	60	0.256
	L	20	1.660	20	0.02260	80	0.269
	U	25	1.889	25	0.02546	100	0.281
	B	30	2.144	30	0.02859	120	0.294
	L	35	2.427	35	0.03204	140	0.307
	E	40	2.740	40	0.03581	160	0.320
		45	3.087	45	0.03994	180	0.332
		50	3.469	50	0.04445	200	0.345
		55	3.889	55	0.04935	220	0.358
		60	4.351	60	0.05468	240	0.370
		65	4.858	65	0.06046	260	0.383
		70	5.412	70	0.06672	280	0.396
		75	6.017	75	0.07349	300	0.408
		80	6.677	80	0.08079	320	0.421
		85	7.395	85	0.08866	340	0.434
		90	8.174	90	0.09712	360	0.446
		95	9.020	95	0.10620	380	0.459
		100	9.936	100	0.11590	400	0.472
		105	10.930	105	0.12640	420	0.484
		110	11.990	110	0.13750	440	0.497
		115	13.150	115	0.14940	460	0.510
		120	14.390	120	0.16210	480	0.522
		125	15.720	125	0.17560	500	0.535

# 1,5,9-CYCLODODECATRIENE

CYT

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	
Liquid	Colorless
Floats on water.	
Shut off ignition sources and call fire department. Avoid inhalation. Wear full impervious protective clothing and approved respirator. Notify local health and pollution control agencies. Protect water intakes.	
Fire	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.
Exposure	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Corrosive to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
where legal  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 30; Olefins  
2.2 Formula:  $(CH_2CH=CH-CH_2)_3$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: 2518  
2.5 CAS Registry No.: 4904-61-4  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation and burns of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentration.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 160°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Vapors can flow along surfaces to distant ignition source and flash back.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 78.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 21.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%; technical.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Pressure vacuum valve.  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	-
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 162.28  
9.3 **Boiling Point at 1 atm:** 447.8°F = 231°C = 504°K  
9.4 **Freezing Point:** -0.4°F = -18°C = 255°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.8925  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# 1,5,9-CYCLODODECATRIENE

CYT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DIACETONE ALCOHOL

DAA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diacetone 4-Hydroxy-4-methyl-2-pentanone Tyranon	Watery liquid  Colorless to light yellow  Mild, pleasant odor  Floats and mixes with water.
Avoid contact with liquid. Avoid inhalation. Wear goggles and self-contained breathing apparatus. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohols, glycols  
2.2 Formula:  $\text{CH}_3\text{C}(\text{OH})(\text{CH}_3)\text{CH}_2\text{COCH}_3$   
2.3 IMO/UN Designation: 3.3/1148  
2.4 DOT ID No.: 1148  
2.5 CAS Registry No.: 123-42-2  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51229

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air pack or organic canister, rubber gloves, goggles.  
3.2 **Symptoms Following Exposure:** Vapor is irritating to the mucous membrane of the eye and respiratory tract. Inhalation can cause dizziness, nausea, some anesthesia. Very high concentrations have a narcotic effect. The liquid is not highly irritating to the skin but can cause dermatitis.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. Give artificial respiration if breathing has stopped. CONTACT WITH EYES OR SKIN: wash affected skin areas with water; flush eyes with water and get medical care if discomfort persists.  
3.4 **TLV-TWA:** 50 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 1,800 ppm  
3.14 **OSHA PEL-TWA:** 50 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 142°F O.C. 125°F C.C.  
4.2 **Flammable Limits in Air:** 1.8%-6.9%  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 1118°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.0%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 116.16  
9.3 **Boiling Point at 1 atm:** 328°F = 164.4°C = 437.4°K  
9.4 **Freezing Point:** -45.0°F = -42.8°C = 230.4°K  
9.5 **Critical Temperature:** 633.2°F = 334°C = 607.2°K  
9.6 **Critical Pressure:** 380 psia = 36 atm = 3.6 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.938 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 4.0  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.052  
9.12 **Latent Heat of Vaporization:** 150 Btu/lb = 85 cal/g = 3.6 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -13,000 Btu/lb = -7,250 cal/g = -303 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.07 psia

### NOTES

# DIACETONE ALCOHOL

DAA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	59.520	85	0.490		N	52	3.836
50	59.180	90	0.498		O	54	3.747
60	58.830	95	0.506		T	56	3.660
70	58.480	100	0.514			58	3.576
80	58.140	105	0.522		P	60	3.495
90	57.790	110	0.530		E	62	3.416
100	57.440	115	0.538		R	64	3.339
110	57.100	120	0.545		T	66	3.265
120	56.750	125	0.553		I	68	3.193
130	56.400	130	0.561		N	70	3.123
140	56.060	135	0.569		E	72	3.055
150	55.710	140	0.577		N	74	2.989
160	55.360	145	0.585		T	76	2.925
170	55.020	150	0.593			78	2.862
180	54.670					80	2.802
190	54.320					82	2.743
200	53.970					84	2.686
210	53.630					86	2.630

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	60	0.013	60	0.00028	0	0.315
	I	80	0.030	80	0.00061	20	0.325
	S	100	0.065	100	0.00125	40	0.335
	C	120	0.128	120	0.00239	60	0.345
	I	140	0.239	140	0.00431	80	0.355
	B	160	0.424	160	0.00740	100	0.364
	L	180	0.718	180	0.01215	120	0.374
	E	200	1.169	200	0.01917	140	0.383
		220	1.834	220	0.02920	160	0.392
		240	2.787	240	0.04310	180	0.401
		260	4.115	260	0.06187	200	0.410
		280	5.920	280	0.08661	220	0.418
		300	8.320	300	0.11850	240	0.427
		320	11.450	320	0.15890	260	0.435
		340	15.450	340	0.20900	280	0.444
		360	20.480	360	0.27040	300	0.452
		380	26.720	380	0.34440	320	0.460
						340	0.467
						360	0.475
						380	0.483
						400	0.490
						420	0.498
						440	0.505

# DIMETHYLACETAMIDE

DAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, dimethylamide N-N-Dimethylacetamide	Liquid  Colorless  Weak fishy odor  Mixes with water.
Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, alcohol foam, or carbon dioxide.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{CON}(\text{CH}_3)_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 127-19-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Liquid causes mild irritation of eyes and skin. Ingestion causes depression, lethargy, confusion and disorientation, visual and auditory hallucinations, perceptual distortions, delusions, emotional detachment, and affective blunting.  
3.3 **Treatment of Exposure:** EYES: flush with plenty of water for 15 min.; get medical attention. SKIN: flush with plenty of water for 15 min. INGESTION: induce vomiting and follow with gastric lavage and saline cathartics; treatment for liver and kidney injury is supportive and symptomatic.  
3.4 **TLV-TWA:** 10 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; oral  $\text{LD}_{50}$  = 5.63 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May produce chronic liver and kidney damage.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** 46.8 ppm  
3.13 **IDLH Value:** 300 ppm  
3.14 **OSHA PEL-TWA:** 10 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 158°F O.C.  
4.2 **Flammable Limits in Air:** 1.5%-11.5%  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 914°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 2.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 32.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** U240  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 87.1  
9.3 **Boiling Point at 1 atm:** 331°F = 166°C = 439°K  
9.4 **Freezing Point:** -4°F = -20°C = 253°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.943 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 34 dynes/cm = 0.034 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 214 Btu/lb = 119 cal/g =  $4.98 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -12,560 Btu/lb = -6,980 cal/g =  $-292 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIMETHYLACETAMIDE

DAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	59.680	40	0.470	65	1.178	40	1.215
50	59.360	50	0.473	70	1.170	50	1.122
60	59.050	60	0.476	75	1.162	60	1.039
70	58.740	70	0.479	80	1.155	70	0.965
80	58.430	80	0.482	85	1.147	80	0.899
90	58.120	90	0.485	90	1.139	90	0.840
100	57.800	100	0.488	95	1.132	100	0.786
110	57.490	110	0.490	100	1.124	110	0.738
120	57.180	120	0.493	105	1.116	120	0.694
130	56.870	130	0.496	110	1.109	130	0.654
140	56.550	140	0.499	115	1.101	140	0.617
150	56.240	150	0.502	120	1.093	150	0.584
160	55.930	160	0.505	125	1.086	160	0.554
170	55.620	170	0.508	130	1.078	170	0.525
180	55.310	180	0.511	135	1.070	180	0.500
190	54.990	190	0.514	140	1.063	190	0.476
200	54.680	200	0.516	145	1.055	200	0.454
210	54.370	210	0.519	150	1.047	210	0.433
				155	1.040		
				160	1.032		
				165	1.024		
				170	1.016		
				175	1.009		
				180	1.001		
				185	0.993		
				190	0.986		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	130	0.198	130	0.00272	0	0.265
	I	140	0.262	140	0.00355	20	0.274
	S	150	0.345	150	0.00459	40	0.283
	C	160	0.449	160	0.00588	60	0.292
	I	170	0.581	170	0.00748	80	0.301
	B	180	0.744	180	0.00944	100	0.309
	L	190	0.947	190	0.01192	120	0.318
	E	200	1.195	200	0.01470	140	0.327
		210	1.499	210	0.01816	160	0.336
		220	1.867	220	0.02229	180	0.345
		230	2.311	230	0.02719	200	0.354
		240	2.843	240	0.03297	220	0.363
		250	3.477	250	0.03975	240	0.372
		260	4.229	260	0.04768	260	0.381
		270	5.115	270	0.05688	280	0.390
		280	6.156	280	0.06753	300	0.399
		290	7.372	290	0.07979	320	0.408
		300	8.787	300	0.09385	340	0.417
		310	10.430	310	0.10990	360	0.426
		320	12.310	320	0.12820	380	0.435
		330	14.490	330	0.14880	400	0.444
						420	0.453
						440	0.461

# N,N-DIETHYLETHANOLAMINE

DAE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> DEAE Diethylaminoethanol 2-N-Diethylaminoethanol 2-Hydroxytriethylamine	Liquid  Colorless  Amine  Floats and mixes with water.
<b>Keep people away. AVOID CONTACT WITH LIQUID.</b> <b>Avoid inhalation.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with water, dry chemical, carbon dioxide, or alcohol foam.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID. Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 8; Alkanolamine 2.2 Formula: (C <sub>2</sub> H <sub>5</sub> ) <sub>2</sub> NC <sub>2</sub> H <sub>4</sub> OH 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 2686 2.5 CAS Registry No.: 100-27-8 2.6 NAERG Guide No.: 132 2.7 Standard Industrial Trade Classification: 51461
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Rubber gloves, all purpose canister respirator, overalls, face shield or goggles. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Irritation of mucous membranes. EYES: Corrosive, causes intense pain. SKIN: Severe irritation. May cause allergic skin reaction. INGESTION: Gastrointestinal irritation. 3.3 <b>Treatment of Exposure:</b> Call a doctor. INHALATION: Remove from exposure. If breathing has stopped, give artificial respiration. EYES: Flush with copious amounts of water for at least 15 min. SKIN: Wash with soap and water. Remove contaminated clothing. INGESTION: Drink large amounts of water, milk, lemon juice or demulcents. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = .5 to 5 g/kg 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentration. The effect is temporary. 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 3.12 <b>Odor Threshold:</b> abs. perception limit in air = 0.011 ppm. 100% recognition in air = 0.04 ppm. 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 135°F O.C. 125°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Alcohol foam, CO<sub>2</sub>, dry chemical foam or water fog.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not listed  
4.5 **Special Hazards of Combustion Products:** Toxic and irritating gases may be generated.  
4.6 **Behavior in Fire:** Can react with oxidizing materials.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 46.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 14.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
80-120 ppm/24 hr/creek chub/critical range. (range below which all fish lived and above which all died).  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.5%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 117.19  
9.3 **Boiling Point at 1 atm:** 315.5–327.2°F = 157.5–164°C = 430.7–437.2°K  
9.4 **Freezing Point:** –36.4°F = –38°C = 235.2°K  
9.5 **Critical Temperature:** 709.9°F = 376.6°C = 649.8°K  
9.6 **Critical Pressure:** 457.3 psia = 31.11 atm = 3.15 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.8921 at 25°C  
9.8 **Liquid Surface Tension:** (est.) 34.3 dynes/cm = 0.0343 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 4.03  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) > 1  
9.12 **Latent Heat of Vaporization:** 140.2 Btu/lb = 77.9 cal/g = 3.26 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** 964 Kcal/mole  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# N,N-DIETHYLETHANOLAMINE

DAE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	55.690	68	0.813		C U R R E N T L Y		C U R R E N T L Y
69	55.606				N O T		N O T
70	55.522				A V A I L A B L E		A V A I L A B L E
71	55.438						
72	55.354						
73	55.271						
74	55.188						
75	55.105						
76	55.022						
77	54.940						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	80	0.037	80	0.00110		C U R R E N T L Y
		100	0.094	100	0.00172		N O T
		120	0.200	120	0.00268		A V A I L A B L E
		140	0.379	140	0.00417		
		160	0.660	160	0.00650		
		180	1.074	180	0.01013		
		200	1.661	200	0.01579		
		220	2.465	220	0.02460		
		240	3.534	240	0.03834		
		260	4.922	260	0.05974		
		280	6.689	280	0.09310		
		300	8.901	300	0.14508		
		320	11.627	320	0.22609		

# DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT

DAI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isopropylamine dodecylbenzenesulfonate Dodecylbenzenesulfonate sodium salt Sodium dodecylbenzene sulfonate Naccanol NR or SW Detergent HD-90	Solid  Off-white  Sweet petroleum  May float or sink and mix with water.
Keep people away. Avoid contact with solid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 <b>CG Compatibility Group:</b> Not listed. 2.2 <b>Formula:</b> C <sub>12</sub> H <sub>25</sub> CS <sub>3</sub> H <sub>7</sub> SO <sub>3</sub> HN(C <sub>3</sub> H <sub>7</sub> ) <sub>2</sub> 2.3 <b>IMO/UN Designation:</b> Not listed 2.4 <b>DOT ID No.:</b> Not listed 2.5 <b>CAS Registry No.:</b> Currently not available 2.6 <b>NAERG Guide No.:</b> Not listed 2.7 <b>Standard Industrial Trade Classification:</b> 51549
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Rubber gloves; goggles; mask (for liquid form) 3.2 <b>Symptoms Following Exposure:</b> Ingestion causes mild irritation of mouth and stomach. Contact with liquid causes irritation of eyes and (on prolonged contact) mild irritation of skin. 3.3 <b>Treatment of Exposure:</b> INGESTION: give large amount of water; consult a doctor if large amount was ingested. EYES: flush with water for at least 15 min.; consult a doctor if irritation persists. SKIN: flush with water. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 3.54 g/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** (liquid) > 300°F C.C.  
4.2 **Flammable Limits in Air:** No reaction  
4.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 96+%; may also be shipped as a concentrated solution in a combustible petroleum solvent.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 385.5  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.03 at 20°C (solid) 1.03 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT

DAI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DECALDEHYDE

DAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aldehyde C-10 Capraldehyde Capric aldehyde Decanal n-Decyl aldehyde	Liquid  Colorless to light yellow  Pleasant odor  Floats on water. Freezing point in 64°F.
Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 19; Aldehyde  
2.2 Formula:  $\text{CH}_2(\text{CH}_2)_8\text{CHO}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Protective clothing and chemical goggles.  
3.2 **Symptoms Following Exposure:** On direct contact can produce eye and skin irritation; low general toxicity.  
3.3 **Treatment of Exposure:** CONTACT WITH EYES AND SKIN: wash with water for 15 min.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 0;  $\text{LD}_{50}$ >33.3 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Skin effects thought to be minor.  
3.12 **Odor Threshold:** 0.168 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 185°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 69.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 20.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 145.3  
9.3 **Boiling Point at 1 atm:** 404 to 410°F = 207 to 210°C = 480 to 483°K  
9.4 **Freezing Point:** 64°F = 18°C = 291°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.830 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** 28.0 dynes/cm = 0.0280 N/m at 24°C  
9.9 **Liquid Water Interfacial Tension:** 16.9 dynes/cm = 0.0169 N/m at 22.7°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.036  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -18,000 Btu/lb = -10,000 cal/g = -424 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DECALDEHYDE

DAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
65	51.600	85	0.548	70	1.005	64	2.112
70	51.430	90	0.551	80	0.997	66	2.063
75	51.261	95	0.554	90	0.989	68	2.015
80	51.080	100	0.557	100	0.982	70	1.968
85	50.910	105	0.560	110	0.974	72	1.923
90	50.740	110	0.563	120	0.966	74	1.879
95	50.560	115	0.565	130	0.959	76	1.837
100	50.390	120	0.568	140	0.951	78	1.796
		125	0.571	150	0.943	80	1.756
		130	0.574	160	0.935	82	1.717
		135	0.577	170	0.928	84	1.679
		140	0.580	180	0.920	86	1.643
		145	0.583	190	0.912	88	1.607
		150	0.586	200	0.905	90	1.573
						92	1.539
						94	1.507
						96	1.475
						98	1.444

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	170	0.013	170	0.00028	0	0.349
	N	180	0.021	180	0.00045	25	0.364
	S	190	0.034	190	0.00070	50	0.379
	O	200	0.053	200	0.00109	75	0.393
	L	210	0.082	210	0.00166	100	0.407
	U	220	0.125	220	0.00250	125	0.421
	B	230	0.189	230	0.00372	150	0.435
	I	240	0.282	240	0.00546	175	0.449
	E	250	0.415	250	0.00792	200	0.462
		260	0.604	260	0.01136	225	0.476
		270	0.869	270	0.01612	250	0.489
		280	1.238	280	0.02265	275	0.502
		290	1.744	290	0.03150	300	0.515
		300	2.435	300	0.04339	325	0.527
		310	3.368	310	0.05923	350	0.540
		320	4.618	320	0.08016	375	0.552
		330	6.277	330	0.10760	400	0.564
						425	0.576
						450	0.587
						475	0.599
						500	0.610
						525	0.621
						550	0.632
						575	0.643
						600	0.654

# DIPHENYLAMINE

DAM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Anilinobenzene N-Phenylaniline	Solid  Light tan to brown  Pleasant odor  Sinks in water.
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Call fire department.</b> <b>Avoid contact with liquid and solid.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals or carbon dioxide. Water and foam may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** (C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>NH  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 122-39-4  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51462

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respirator; safety goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Inhalation may irritate mucous membranes. Overexposure, including ingestion of solid or skin contact, may cause fast pulse, hypertension, and bladder trouble. Contact with dust irritates eyes.  
3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air. INGESTION: get medical attention; observe for methemoglobinemia. EYES: flush with plenty of water and see physician. SKIN: wash with soap and water.  
3.4 **TLV-TWA:** 10 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 2,000 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Causes birth defects in rats (polycytic kidneys)  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** (liquid) 307°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.  
4.6 **Behavior in Fire:** Dust may be explosive if mixed with air in critical proportions and in the presence of a source of ignition.  
4.7 **Auto Ignition Temperature:** 1,175°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 75.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 18.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Not pertinent  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 3  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; sometimes shipped as liquid  
7.2 **Storage Temperature:** Ambient for solid, elevated for liquid  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** (A)  
7.6 **Ship Type:** 1  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 169.2  
9.3 **Boiling Point at 1 atm:** 576°F = 302°C = 575°K  
9.4 **Freezing Point:** 127°F = 53°C = 326°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.068 at 61°C (liquid)  
9.8 **Liquid Surface Tension:** 39.3 dynes/cm = 0.0393 N/m at 60°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -16,300 Btu/lb = -9,060 cal/g = -379 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 25.23 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIPHENYLAMINE

DAM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
141	65.540		N O T  P E R T I N E N T		N O T  P E R T I N E N T	130 135 140 145 150 155 160 165 170	5.106 4.611 4.172 3.780 3.431 3.118 2.839 2.589 2.364

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# N-DECYL ALCOHOL

DAN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Alcohol C-10 Capric alcohol 1-Decanol Dytol S-91 Lorol-22 Nonylcarbinol	Liquid                      Colorless to light yellow                      Faint alcohol odor  Floats on water. Freezing point is 44°F.
Keep people away. Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to eyes. If in eyes, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment:  
 Absorb  
 Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohols, glycols  
 2.2 Formula:  $\text{CH}_3(\text{CH}_2)_9\text{CH}_2\text{OH}$   
 2.3 IMO/UN Designation: Not listed  
 2.4 DOT ID No.: Not listed  
 2.5 CAS Registry No.: 112-30-1  
 2.6 NAERG Guide No.: Not listed  
 2.7 Standard Industrial Trade Classification: 51229

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield.  
 3.2 Symptoms Following Exposure: Direct contact can produce eye irritation; low general toxicity.  
 3.3 Treatment of Exposure: CONTACT WITH EYES: flush with water for 15 min.  
 3.4 TLV-TWA: Not pertinent  
 3.5 TLV-STEL: Not pertinent  
 3.6 TLV-Ceiling: Not listed.  
 3.7 Toxicity by Ingestion: Grade 1;  $\text{LD}_{50}$  = 5 to 15 g/kg (rat)  
 3.8 Toxicity by Inhalation: Currently not available.  
 3.9 Chronic Toxicity: Currently not available  
 3.10 Vapor (Gas) Irritant Characteristics: None  
 3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
 3.12 Odor Threshold: Currently not available  
 3.13 IDLH Value: Not listed.  
 3.14 OSHA PEL-TWA: Not listed.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 180°F O.C.  
 4.2 Flammable Limits in Air: Currently not available  
 4.3 Fire Extinguishing Agents: Dry chemical  
 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
 4.5 Special Hazards of Combustion Products: Not pertinent  
 4.6 Behavior in Fire: Not pertinent  
 4.7 Auto Ignition Temperature: 550°F  
 4.8 Electrical Hazards: Currently not available  
 4.9 Burning Rate: Currently not available  
 4.10 Adiabatic Flame Temperature: Currently not available  
 4.11 Stoichiometric Air to Fuel Ratio: 71.4 (calc.)  
 4.12 Flame Temperature: Currently not available  
 4.13 Combustion Molar Ratio (Reactant to Product): 21.0 (calc.)  
 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
 5.2 Reactivity with Common Materials: No reaction  
 5.3 Stability During Transport: Stable  
 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
 5.5 Polymerization: Not pertinent  
 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
 6.2 Waterfowl Toxicity: Currently not available  
 6.3 Biological Oxygen Demand (BOD): 29.3%, 1 day  
 6.4 Food Chain Concentration Potential: None  
 6.5 GESAMP Hazard Profile:  
 Bioaccumulation: 0  
 Damage to living resources: 3  
 Human Oral hazard: 1  
 Human Contact hazard: 0  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 95-99%  
 7.2 Storage Temperature: Ambient  
 7.3 Inert Atmosphere: No requirement  
 7.4 Venting: Open (flame arrester)  
 7.5 IMO Pollution Category: B  
 7.6 Ship Type: 3  
 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
 8.2 49 CFR Class: Not pertinent  
 8.3 49 CFR Package Group: Not listed.  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
 9.2 Molecular Weight: 158.29  
 9.3 Boiling Point at 1 atm: 446°F = 230°C = 503°K  
 9.4 Freezing Point: 44°F = 6.9°C = 280.1°K  
 9.5 Critical Temperature: 800.6°F = 427°C = 700.2°K  
 9.6 Critical Pressure: 320 psia = 22 atm = 2.2 MN/m<sup>2</sup>  
 9.7 Specific Gravity: 0.840 at 20°C (liquid)  
 9.8 Liquid Surface Tension: 28.9 dynes/cm = 0.0289 N/m at 20°C  
 9.9 Liquid Water Interfacial Tension: (est.) 60 dynes/cm = 0.06 N/m at 10°C  
 9.10 Vapor (Gas) Specific Gravity: Not pertinent  
 9.11 Ratio of Specific Heats of Vapor (Gas): 1.035  
 9.12 Latent Heat of Vaporization: (est.) 130 Btu/lb = 74 cal/g = 3.1 X 10<sup>5</sup> J/kg  
 9.13 Heat of Combustion: -18,000 Btu/lb = -9980 cal/g = 418 X 10<sup>5</sup> J/kg  
 9.14 Heat of Decomposition: Not pertinent  
 9.15 Heat of Solution: Not pertinent  
 9.16 Heat of Polymerization: Not pertinent  
 9.17 Heat of Fusion: Currently not available  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: Very low

### NOTES

# N-DECYL ALCOHOL

DAN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	52.630	85	0.549	90	1.130		C U R R E N T L Y  N O T  A V A I L A B L E
70	52.370	90	0.559	95	1.127		
80	52.110	95	0.569	100	1.125		
90	51.840	100	0.579	105	1.122		
100	51.580	105	0.590	110	1.119		
110	51.320	110	0.600	115	1.116		
120	51.050	115	0.610	120	1.114		
130	50.790	120	0.620	125	1.111		
140	50.520	125	0.630	130	1.108		
150	50.260	130	0.640	135	1.105		
160	50.000	135	0.650	140	1.102		
170	49.730	140	0.660	145	1.100		
180	49.470	145	0.671	150	1.097		
190	49.210	150	0.681	155	1.094		
200	48.940			160	1.091		
210	48.680			165	1.089		
				170	1.086		
				175	1.083		
				180	1.080		
				185	1.077		
				190	1.075		
				195	1.072		
				200	1.069		
				205	1.066		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		80	0.000	80	0.00000	0	0.332
		100	0.001	100	0.00001	20	0.343
		120	0.002	120	0.00004	40	0.354
		140	0.005	140	0.00012	60	0.365
		160	0.013	160	0.00030	80	0.375
		180	0.029	180	0.00067	100	0.386
		200	0.062	200	0.00138	120	0.396
		220	0.123	220	0.00266	140	0.406
		240	0.228	240	0.00481	160	0.417
		260	0.403	260	0.00826	180	0.427
		280	0.679	280	0.01353	200	0.436
		300	1.096	300	0.02127	220	0.446
		320	1.706	320	0.03227	240	0.456
		340	2.571	340	0.04740	260	0.465
		360	3.762	360	0.06768	280	0.474
		380	5.363	380	0.09418	300	0.484
		400	7.467	400	0.12810	320	0.493
		420	10.180	420	0.17060	340	0.502
		440	13.610	440	0.22300	360	0.510
		460	17.880	460	0.28660	380	0.519
		480	23.110	480	0.36270	400	0.528
						420	0.536
						440	0.544

# DI-N-AMYL PHTHALATE

DAP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diamyl phthalate Dipentyl phthalate Phthalic acid, diamyl ester Phthalic acid, dipentyl ester		Liquid	White	Odorless
		Floats on water.		
<b>Keep people away.</b> <b>Shut off ignition sources. Call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b>				
<b>Fire</b>	Combustible. Extinguish with dry chemicals or carbon dioxide. Water and foam may be ineffective on fire. Cool exposed containers with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, coughing, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{14}H_{18}(COOC_8H_{17})_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves  
3.2 Symptoms Following Exposure: Inhalation of vapors from very hot material may cause headache, drowsiness, and convulsions. Hot vapors may irritate eyes.  
3.3 Treatment of Exposure: INHALATION: move to fresh air. EYES: flush with water. SKIN: wipe off; flush with water; wash with soap and water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Causes birth defects in rats (skeletal and gross abnormalities)  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 245°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 107.1 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 31.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: May attack some forms of plastics  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Technical  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 306  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.82 at 20°C (liquid)  
9.8 Liquid Surface Tension: 31.5 dynes/cm = 0.0315 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: 140 Btu/lb = 76 cal/g =  $3.2 \times 10^5$  J/kg  
9.13 Heat of Combustion: -13,900 Btu/lb = -7,720 cal/g =  $-323 \times 10^5$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES



# DI-N-AMYL PHTHALATE

DAP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	51.190		N O T  P E R T I N E N T		N O T  P E R T I N E N T	70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190	33.740 30.130 26.970 24.190 21.730 19.570 17.650 15.950 14.440 13.100 11.900 10.820 9.864 9.004 8.231 7.536 6.909 6.343 5.832 5.369 4.950 4.569 4.223 3.907 3.620

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.010	125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250	0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.001 0.001 0.001 0.001 0.001 0.001 0.002 0.002 0.002	125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250	0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00001 0.00001 0.00001 0.00001 0.00001 0.00001 0.00002 0.00002 0.00003 0.00003 0.00004 0.00005 0.00006 0.00007 0.00009	N O T  P E R T I N E N T	

# N-DECYL ACRYLATE

DAR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acrylic acid, decyl ester Decyl acrylate Decyl acrylate, inhibited 2-Propenoic acid, decyl ester	Liquid  Floats on water.
<b>Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources. Call fire department. Evacuate area in case of large spill. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRES. Container may explode in fire. Vapor may explode if ignited in an enclosed area. Fight fires from safe distance or protected location. Extinguish small fires: dry chemicals, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Water or foam may cause frothing. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. IF IN EYES OR ON SKIN: flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS, have victim drink several glasses of water and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS or HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Fouling to shoreline. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 14; Acrylates  
2.2 Formula: CH<sub>2</sub>(CH<sub>2</sub>)<sub>9</sub>OCOCH=CH<sub>2</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 2158-96-9  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.  
3.2 **Symptoms Following Exposure:** INHALATION: Higher concentrations may cause pronounced pulmonary irritation or edema. Prolonged contact may cause severe damage to tissues. May be fatal if swallowed or absorbed through skin.  
3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: immediately flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. INGESTION: if conscious, give victim several glasses of water and induce vomiting. If unconscious or having convulsions, do nothing except keep victim warm.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 6.46 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 260°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** May contain acid smoke and fumes including toxic acrylic acid, one of the most serious eye injury chemicals and a severe skin irritant.  
4.6 **Behavior in Fire:** It may decompose to yield acid smoke and fumes.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not applicable  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 85.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 25.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Avoid contact with copper, copper alloys, zinc, galvanized steel, alloys having more than 10 percent zinc by weight, strong oxidizing agents and polymerization initiators.  
5.3 **Stability During Transport:** STABLE. Avoid heat, light and polymerization initiators.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not appl  
5.5 **Polymerization:** Will polymerize unless inhibited. Inhibited material may polymerize if heated, if cooled so that the inhibitor crystallizes, if stored in an oxygen-free atmosphere, or if stored in contact with copper and copper alloys, zinc and zinc alloys with more than 10% zinc, and galvanized steel. Strong oxidizers and other contaminants may also initiate this reaction.  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 212.37  
9.3 **Boiling Point at 1 atm:** 473°F = 263°C = 536°K (est.)  
9.4 **Freezing Point:** <32°F = <0°C = <273°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.8781 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 7.3 (est.)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N-DECYL ACRYLATE

DAR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	54.810		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DODECYL BENZENE SULFONIC ACID, SODIUM SALT

DAS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Detergent HD-90 Dodecylbenzenesulfonate sodium salt Dodecylbenzenesulfonic acid, sodium salt Naccanol NR or SW Sodium dodecylbenzene sulfonate	Pasty liquid or solid      White to yellow      Odorless to slight oily  Mixes with water. Soap bubbles may be produced.
Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, and diarrhea. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> Not listed. <b>2.2 Formula:</b> C <sub>18</sub> H <sub>35</sub> SO <sub>3</sub> Na C <sub>18</sub> H <sub>33</sub> NaO <sub>3</sub> S <b>2.3 IMO/UN Designation:</b> Not listed <b>2.4 DOT ID No.:</b> Not listed <b>2.5 CAS Registry No.:</b> Currently not available <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 51549
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Rubber gloves, safety glasses. <b>3.2 Symptoms Following Exposure:</b> Minor skin and eye irritant. INGESTION: May cause vomiting, diarrhea, and intestinal distension. <b>3.3 Treatment of Exposure:</b> Call a physician. EYES: Flush skin and eyes with copious amounts of water. INGESTION: Give fluids. Induce vomiting. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg. <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Possible teratogenic effects. May cause skin rash after prolonged exposure. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Not pertinent. Non-volatile (vapor is water). <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** Not pertinent  
**4.2 Flammable Limits in Air:** Not flammable  
**4.3 Fire Extinguishing Agents:** Water  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Not pertinent  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** Not pertinent  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Will not occur.  
**5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
4 to 6 ppm/15 days/carp and trout/toxic threshold  
<5.6 ppm/silver salmon/critical level in aerated lake water.  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** 4% 5 days (NACCANOL NR) 9% 5 days (Santomerse 3) 0.02 g/g for 5 days  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 40% H<sub>2</sub>O. Varies with manufacturer and use.  
**7.2 Storage Temperature:** Temperature above 32°F  
**7.3 Inert Atmosphere:** Not required.  
**7.4 Venting:** Open  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed.  
**8.2 49 CFR Class:** Not pertinent  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Solid or liquid  
**9.2 Molecular Weight:** 348.49  
**9.3 Boiling Point at 1 atm:** Foams as water boils. 212°F = 100°C = 373.2°K  
**9.4 Freezing Point:** Not pertinent  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 1.0 at 20°C for 60% slurry  
**9.8 Liquid Surface Tension:** Not pertinent  
**9.9 Liquid Water Interfacial Tension:** Not pertinent  
**9.10 Vapor (Gas) Specific Gravity:** Vapor is water.  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
**9.12 Latent Heat of Vaporization:** Not pertinent  
**9.13 Heat of Combustion:** Not pertinent  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# DODECYL BENZENE SULFONIC ACID, SODIUM SALT

DAS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	63.600		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E	100	0.967		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DI-N-BUTYLAMINE

DBA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Butanamine, n-butyl Dibutylamine	Liquid	Colorless	Weak ammonia, fishy odor
Floats and mixes with water.			
Keep people away. Shut off ignition sources. Call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Do not burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amine  
2.2 Formula: (C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>NH  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2248  
2.5 CAS Registry No.: 111-92-2  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose, throat, and lungs; coughing; nausea; headache. Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation. Contact with skin causes irritation and dermatitis.  
3.3 **Treatment of Exposure:** INHALATION: move from exposure; if breathing has stopped, start artificial respiration. INGESTION: give large amount of water. EYES: irrigate with water for 15 min.; get medical attention for possible eye damage. SKIN: wash with large amounts of water for 15 min.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 360 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 125°F O.C.  
4.2 **Flammable Limits in Air:** 1.1% (LFL)  
4.3 **Fire Extinguishing Agents:** "Alcohol" foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 5.84 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 65.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 18.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May corrode some metals and attack some forms of plastics  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 129.25  
9.3 **Boiling Point at 1 atm:** 319.3°F = 159.6°C = 432.8°K  
9.4 **Freezing Point:** -80°F = -62°C = 211°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.759 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 24.76 dynes/cm = 0.02476 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 4.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 130 Btu/lb = 72.3 cal/g = 3.03 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -18,800 Btu/lb = -10,440 cal/g = -436.8 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.0 psia

### NOTES

# DI-N-BUTYLAMINE

DBA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
30	48.300	50	0.554	50	0.970	35	1.221
35	48.180	51	0.554	51	0.970	40	1.163
40	48.050	52	0.554	52	0.970	45	1.108
45	47.920	53	0.554	53	0.970	50	1.058
50	47.790	54	0.554	54	0.970	55	1.010
55	47.660	55	0.554	55	0.970	60	0.965
60	47.530	56	0.554	56	0.970	65	0.924
65	47.400	57	0.554	57	0.970	70	0.885
70	47.260	58	0.554	58	0.970	75	0.848
75	47.130	59	0.554	59	0.970	80	0.813
80	46.990	60	0.554	60	0.970	85	0.780
85	46.860	61	0.554	61	0.970	90	0.750
90	46.720	62	0.554	62	0.970	95	0.721
95	46.590	63	0.554	63	0.970	100	0.693
100	46.450	64	0.554	64	0.970	105	0.667
105	46.310	65	0.554	65	0.970	110	0.643
110	46.170	66	0.554	66	0.970	115	0.619
115	46.030	67	0.554	67	0.970	120	0.597
120	45.890	68	0.554	68	0.970		
125	45.750	69	0.554	69	0.970		
130	45.610	70	0.554	70	0.970		
135	45.460	71	0.554	71	0.970		
140	45.320	72	0.554	72	0.970		
145	45.170	73	0.554	73	0.970		
150	45.030	74	0.554	74	0.970		
		75	0.554	75	0.970		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.470	70	0.038	70	0.00086		N
		80	0.055	80	0.00123		O
		90	0.079	90	0.00173		T
		100	0.111	100	0.00240		
		110	0.155	110	0.00327		P
		120	0.212	120	0.00440		E
		130	0.286	130	0.00584		R
		140	0.382	140	0.00766		T
		150	0.503	150	0.00993		I
		160	0.655	160	0.01272		N
		170	0.843	170	0.01613		E
		180	1.076	180	0.02026		N
		190	1.361	190	0.02521		T
		200	1.705	200	0.03111		
		210	2.118	210	0.03808		
		220	2.611	220	0.04625		
		230	3.194	230	0.05577		
		240	3.881	240	0.06679		
		250	4.683	250	0.07946		
		260	5.616	260	0.09396		
		270	6.693	270	0.11040		
		280	7.932	280	0.12910		
		290	9.348	290	0.15010		
		300	10.960	300	0.17370		
		310	12.790	310	0.20000		
		320	14.850	320	0.22930		

# DIISOBUTYLCARBINOL

DBC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,6-Dimethyl-4-heptanol		Oily liquid Colorless Floats on water.
Call fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID. LIQUID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 20; Alcohols, glycols  
**2.2 Formula:** [(CH<sub>3</sub>)<sub>2</sub>CHCH<sub>2</sub>]<sub>2</sub>CHOH  
**2.3 IMO/UN Designation:** Not listed  
**2.4 DOT ID No.:** Not listed  
**2.5 CAS Registry No.:** 108-82-7  
**2.6 NAERG Guide No.:** Not listed  
**2.7 Standard Industrial Trade Classification:** 51219

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Air-supplied mask for prolonged exposure; plastic gloves; goggles.  
**3.2 Symptoms Following Exposure:** None expected  
**3.3 Treatment of Exposure:** SKIN AND EYES: Flush with water  
**3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** None  
**3.11 Liquid or Solid Characteristics:** None  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 162°F O.C. 165°F C.C.  
**4.2 Flammable Limits in Air:** 0.8%-6.1%  
**4.3 Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Not pertinent  
**4.7 Auto Ignition Temperature:** 494°F (calc.)  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 64:3 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 19.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 3  
 Human Oral hazard: -  
 Human Contact hazard: -  
 Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 98.0%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester)  
**7.5 IMO Pollution Category:** C  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed  
**8.2 49 CFR Class:** Not pertinent  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 144.26  
**9.3 Boiling Point at 1 atm:** 352°F = 178°C = 451°K  
**9.4 Freezing Point:** -85°F = -65°C = 208°K  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 0.812 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
**9.12 Latent Heat of Vaporization:** 140 Btu/lb = 76 cal/g = 3.2 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** (est.) -17,400 Btu/lb = -9,680 cal/g = -405 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 0.06 psia

### NOTES



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DBC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	51.240	85	0.644	32	1.179	68	14.300
54	51.170	90	0.649	34	1.179		
56	51.100	95	0.653	36	1.179		
58	51.030	100	0.657	38	1.179		
60	50.960	105	0.661	40	1.179		
62	50.900	110	0.666	42	1.179		
64	50.830	115	0.670	44	1.179		
66	50.760	120	0.674	46	1.179		
68	50.690	125	0.679	48	1.179		
70	50.620	130	0.683	50	1.179		
72	50.550	135	0.687	52	1.179		
74	50.480	140	0.692	54	1.179		
76	50.410	145	0.696	56	1.179		
78	50.340	150	0.700	58	1.179		
80	50.270			60	1.179		
82	50.200			62	1.179		
84	50.130			64	1.179		
86	50.060			66	1.179		
				68	1.179		
				70	1.179		
				72	1.179		
				74	1.179		
				76	1.179		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.060	90	0.041	90	0.00101		N O T  P E R T I N E N T
		100	0.057	100	0.00137		
		110	0.078	110	0.00184		
		120	0.106	120	0.00245		
		130	0.142	130	0.00323		
		140	0.188	140	0.00422		
		150	0.247	150	0.00545		
		160	0.322	160	0.00699		
		170	0.416	170	0.00888		
		180	0.533	180	0.01120		
		190	0.678	190	0.01403		
		200	0.856	200	0.01745		
		210	1.074	210	0.02155		
		220	1.337	220	0.02644		
		230	1.655	230	0.03225		
		240	2.036	240	0.03911		
		250	2.490	250	0.04715		
		260	3.028	260	0.05655		
		270	3.663	270	0.06746		
		280	4.408	280	0.08008		
		290	5.278	290	0.09462		
		300	6.291	300	0.11130		
		310	7.463	310	0.13030		
		320	8.815	320	0.15190		
		330	10.370	330	0.17650		
		340	12.150	340	0.20410		

# DI-N-BUTYL ETHER

DBE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Butoxy butane Butyl ether n-Butyl ether Dibutyl ether n-Dibutyl ether Dibutyl oxide	Liquid  Colorless  Mild pleasant odor  Floats on water. Flammable, irritating vapor is produced.
<b>Keep people away. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE: Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 41; Ethers  
2.2 Formula:  $C_4H_{10}OC_4H_9$   
2.3 IMO/UN Designation: 3.3/1149  
2.4 DOT ID No.: 1149  
2.5 CAS Registry No.: 142-96-1  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Liquid irritates eyes and may irritate skin on prolonged contact. Ingestion causes irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air. EYES: after contact with liquid, flush with water for at least 15 min. SKIN: wipe off, wash well with soap and water. INGESTION: induce vomiting.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; oral  $LD_{50}$  = 7,400 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 92°F O.C.  
4.2 **Flammable Limits in Air:** 1.5%-7.6%  
4.3 **Fire Extinguishing Agents:** Dry chemical, "alcohol" foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 382°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 17.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Ambient  
7.2 **Storage Temperature:** No requirement  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 130.2  
9.3 **Boiling Point at 1 atm:** 288°F = 142°C = 415°K  
9.4 **Freezing Point:** -139.7°F = -95.4°C = 177.8°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.767 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 23 dynes/cm = 0.023 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 4.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0434  
9.12 **Latent Heat of Vaporization:** 120 Btu/lb = 68 cal/g =  $2.8 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -17,670 Btu/lb = -9,820 cal/g =  $-411 \times 10^6$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DI-N-BUTYL ETHER

DBE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-35	51.050	-30	0.483	0	0.964	0	1.245
-30	50.890	-20	0.486	10	0.953	10	1.127
-25	50.740	-10	0.488	20	0.942	20	1.025
-20	50.590	0	0.491	30	0.931	30	0.935
-15	50.440	10	0.494	40	0.920	40	0.857
-10	50.280	20	0.497	50	0.909	50	0.788
-5	50.130	30	0.499	60	0.898	60	0.727
0	49.980	40	0.502	70	0.887	70	0.672
5	49.830	50	0.505	80	0.877	80	0.624
10	49.670	60	0.508	90	0.866	90	0.580
15	49.520	70	0.511	100	0.855	100	0.541
20	49.370	80	0.513	110	0.844	110	0.506
25	49.210	90	0.516	120	0.833	120	0.474
30	49.060	100	0.519	130	0.822	130	0.445
35	48.910	110	0.522	140	0.811	140	0.419
40	48.760	120	0.524	150	0.800	150	0.395
45	48.600	130	0.527	160	0.789	160	0.374
50	48.450	140	0.530	170	0.778	170	0.354
55	48.300			180	0.768		
60	48.150						
65	47.990						
70	47.840						
75	47.690						
80	47.540						
85	47.380						
90	47.230						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.030	70	0.103	70	0.00237	0	0.336
		80	0.142	80	0.00319	20	0.345
		90	0.192	90	0.00424	40	0.354
		100	0.258	100	0.00558	60	0.363
		110	0.342	110	0.00728	80	0.372
		120	0.449	120	0.00940	100	0.381
		130	0.585	130	0.01203	120	0.390
		140	0.755	140	0.01526	140	0.398
		150	0.966	150	0.01921	160	0.407
		160	1.226	160	0.02400	180	0.416
		170	1.545	170	0.02976	200	0.425
		180	1.932	180	0.03664	220	0.434
		190	2.401	190	0.04482	240	0.443
		200	2.963	200	0.05448	260	0.452
		210	3.634	210	0.06582	280	0.461
		220	4.430	220	0.07906	300	0.469
		230	5.370	230	0.09445	320	0.478
		240	6.474	240	0.11220	340	0.487
		250	7.763	250	0.13270	360	0.496
		260	9.262	260	0.15610	380	0.505
						400	0.514
						420	0.523
						440	0.532
						460	0.540
						480	0.549
						500	0.558

# DIBROMOMETHANE

DBH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methylene bromide Methylene dibromide	Watery liquid  Colorless  Sweet, pleasant odor Colorless Sweet, pleasant odor
Sinks in water. Irritating vapor is produced.	
Avoid contact with liquid and vapor. Restrict access. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea and dizziness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CH<sub>2</sub>Br<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/2664  
2.4 DOT ID No.: 2664  
2.5 CAS Registry No.: 74-95-3  
2.6 NAERG Guide No.: 160  
2.7 Standard Industrial Trade Classification: 51138

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Organic vapor canister mask, safety glasses, protective clothing.  
3.2 **Symptoms Following Exposure:** INHALATION: Anesthetic effects, nausea and drunkenness.  
CONTACT WITH SKIN AND EYES: Skin irritation of eyes and nose.  
3.3 **Treatment of Exposure:** INHALATION: Remove from exposure. Give oxygen if needed. INGESTION: No specific antidote. CONTACT WITH SKIN AND EYES: Remove contaminated clothing; wash skin or eyes if affected.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 108 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
Not flammable under conditions likely to be encountered.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Dissociation products generated in a fire may be irritating or toxic.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
Not pertinent  
6.2 **Waterfowl Toxicity:** Not pertinent  
6.3 **Biological Oxygen Demand (BOD):** Not pertinent  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical grade  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Inerted  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1 pound  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** U067  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 173.83  
9.3 **Boiling Point at 1 atm:** 206.6°F = 97.0°C = 370.2°K  
9.4 **Freezing Point:** -62.5 = -52.5°C = 220.7°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 2.4970 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 6.05 (est)  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** 166 Btu/lb = 92.3 cal/g = 3.86 x 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 1.7 psia

### NOTES

# DIBROMOMETHANE

DBH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	155.900		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210	1.494 1.416 1.342 1.272 1.205 1.142 1.082 1.026 0.972 0.921 0.873 0.827 0.784 0.743 0.704 0.667

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
35 40 45 50 55 60 65	1.169 1.164 1.160 1.157 1.155 1.153 1.151	-20 0 20 40 60 80 100 120 140 160 180	0.043 0.074 0.128 0.219 0.375 0.642 1.100 1.885 3.229 5.533 9.480		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.073 0.075 0.076 0.077 0.079 0.080 0.081 0.082 0.084 0.085 0.086 0.088 0.089 0.090 0.091 0.093 0.094 0.095 0.097 0.098 0.099 0.100 0.102 0.103 0.104

# DI-N-BUTYL KETONE

DBK

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 5-Nonanone S-Noranone		Liquid Colorless to light yellow  Floats on water. Freezing point is 21°F.
Keep people away. Shut off ignition sources. Call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_7\text{CO}(\text{CH}_2)_3\text{CH}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 1224  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Rubber gloves; goggles or face shield  
3.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation.  
3.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration if needed. EYES: flush with water for at least 15 min. SKIN: flush with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: Currently not available  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 61.9 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 18.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: May attack some forms of plastics.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Currently not available

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: 98 + %  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 142  
9.3 Boiling Point at 1 atm: 370°F = 188°C = 461°K  
9.4 Freezing Point: 21°F = -6°C = 267°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.822 at 20°C (liquid)  
9.8 Liquid Surface Tension: 26.60 dynes/cm = 0.0266 N/m at 21.1°C  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: 161 Btu/lb = 89.6 cal/g =  $3.75 \times 10^5$  J/kg  
9.13 Heat of Combustion: -16,080 Btu/lb = -8,930 cal/g =  $-374 \times 10^5$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# DI-N-BUTYL KETONE

DBK

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	51.430	N O T  P E R T I N E N T		51	1.048		N O T  P E R T I N E N T
40	51.410			52	1.048		
45	51.400			53	1.048		
50	51.390			54	1.048		
55	51.370			55	1.048		
60	51.360			56	1.048		
65	51.340			57	1.048		
70	51.330			58	1.048		
75	51.320			59	1.048		
80	51.300			60	1.048		
85	51.290			61	1.048		
90	51.270			62	1.048		
95	51.260			63	1.048		
100	51.250			64	1.048		
				65	1.048		
				66	1.048		
				67	1.048		
				68	1.048		
				69	1.048		
				70	1.048		
				71	1.048		
				72	1.048		
				73	1.048		
				74	1.048		
				75	1.048		
				76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		130	0.294	130	0.00660		N O T  P E R T I N E N T
		140	0.368	140	0.00813		
		150	0.458	150	0.00994		
		160	0.566	160	0.01208		
		170	0.694	170	0.01458		
		180	0.846	180	0.01749		
		190	1.024	190	0.02086		
		200	1.234	200	0.02474		
		210	1.477	210	0.02918		
		220	1.760	220	0.03425		
		230	2.086	230	0.04000		
		240	2.460	240	0.04651		
		250	2.888	250	0.05383		
		260	3.375	260	0.06204		
		270	3.928	270	0.07120		
		280	4.552	280	0.08141		
		290	5.255	290	0.09273		
		300	6.044	300	0.10520		
		310	6.926	310	0.11900		
		320	7.909	320	0.13420		
		330	9.001	330	0.15080		
		340	10.210	340	0.16890		
		350	11.550	350	0.18860		
		360	13.020	360	0.21010		
		370	14.640	370	0.23340		

# DIISOBUTYLENE

DBL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,4,4-Trimethyl-1-pentene	Liquid	Colorless	Gasoline-like odor
Floats on water. Flammable, irritating vapor is produced.			
Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.			
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Collection Systems: Skim  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
 2.2 Formula:  $(CH_3)_2CCH_2C(CH_3)=CH_2$   
 2.3 IMO/UN Designation: 3.2/2050  
 2.4 DOT ID No.: 2050  
 2.5 CAS Registry No.: 12002-23-2  
 2.6 NAERG Guide No.: 127  
 2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Protective goggles.  
 3.2 **Symptoms Following Exposure:** Low general toxicity; may act as simple asphyxiant in high vapor concentrations.  
 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; support respiration.  
 3.4 TLV-TWA: Not listed.  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Liver and kidney damage in exp. animals.  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 IDLH Value: Not listed.  
 3.14 OSHA PEL-TWA: Not listed.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 35°F (est.)  
 4.2 **Flammable Limits in Air:** 0.9% LEL (est.)  
 4.3 **Fire Extinguishing Agents:** Dry chemicals, foam, or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 788°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 7.9 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Research grade: 99.86%; Pure grade: 99.39%; Technical grade: 98.7%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
 7.5 **IMO Pollution Category:** B  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid  
 8.2 49 CFR Class: 3  
 8.3 49 CFR Package Group: II  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
 9.2 Molecular Weight: 112.22  
 9.3 Boiling Point at 1 atm: 214.7°F = 101.5°C = 374.7°K  
 9.4 Freezing Point: -136.3°F = -93.5°C = 179.7°K  
 9.5 Critical Temperature: 548.1°F = 286.7°C = 559.9°K  
 9.6 Critical Pressure: 380 psia = 25.85 atm = 2.619 MN/m<sup>2</sup>  
 9.7 Specific Gravity: 0.715 at 20°C (liquid)  
 9.8 Liquid Surface Tension: 20.7 dynes/cm = 0.0207 N/m at 20°C  
 9.9 Liquid Water Interfacial Tension: Currently not available  
 9.10 Vapor (Gas) Specific Gravity: Not pertinent  
 9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.049  
 9.12 Latent Heat of Vaporization: 110 Btu/lb = 60 cal/g = 2.5 X 10<sup>5</sup> J/kg  
 9.13 Heat of Combustion: -18,900 Btu/lb = -10,500 cal/g = -440 X 10<sup>5</sup> J/kg  
 9.14 Heat of Decomposition: Not pertinent  
 9.15 Heat of Solution: Not pertinent  
 9.16 Heat of Polymerization: Not pertinent  
 9.17 Heat of Fusion: Currently not available  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: 1.6 psia

### NOTES



# DIISOBUTYLENE

DBL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	45.100	32	0.478	32	1.040		C
54	45.050	34	0.478	34	1.040		U
56	44.990	36	0.478	36	1.040		R
58	44.930	38	0.478	38	1.040		R
60	44.870	40	0.478	40	1.040		E
62	44.810	42	0.478	42	1.040		N
64	44.750	44	0.478	44	1.040		T
66	44.690	46	0.478	46	1.040		L
68	44.630	48	0.478	48	1.040		Y
70	44.570	50	0.478	50	1.040		
72	44.510	52	0.478	52	1.040		N
74	44.460	54	0.478	54	1.040		O
76	44.400	56	0.478	56	1.040		T
78	44.340	58	0.478	58	1.040		
80	44.280	60	0.478	60	1.040		A
82	44.220	62	0.478	62	1.040		V
84	44.160	64	0.478	64	1.040		A
86	44.100	66	0.478	66	1.040		I
88	44.040	68	0.478	68	1.040		L
90	43.980	70	0.478	70	1.040		A
92	43.920	72	0.478	72	1.040		B
94	43.870	74	0.478	74	1.040		L
96	43.810	76	0.478	76	1.040		E
98	43.750						
100	43.690						
102	43.630						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	15	0.125	15	0.00275	100	0.399
	N	20	0.148	20	0.00323	120	0.412
	S	25	0.176	25	0.00379	140	0.424
	O	30	0.207	30	0.00443	160	0.436
	L	35	0.244	35	0.00516	180	0.447
	U	40	0.286	40	0.00599	200	0.459
	B	45	0.335	45	0.00694	220	0.470
	I	50	0.390	50	0.00801	240	0.481
	E	55	0.454	55	0.00921	260	0.492
		60	0.526	60	0.01058	280	0.503
		65	0.607	65	0.01210	300	0.513
		70	0.700	70	0.01382	320	0.524
		75	0.805	75	0.01573	340	0.534
		80	0.922	80	0.01787	360	0.544
		85	1.055	85	0.02025	380	0.554
		90	1.203	90	0.02289	400	0.564
		95	1.369	95	0.02581	420	0.573
		100	1.555	100	0.02905	440	0.582

# M-DICHLOROBENZENE

DBM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,3-Dichlorobenzene meta-Dichlorobenzene	Liquid  Colorless  Sinks in water.
Keep people away. Avoid contact with liquid. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 36; Halogenated hydrocarbon. <b>2.2 Formula:</b> C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub> <b>2.3 IMO/UN Designation:</b> 6.1/1591 <b>2.4 DOT ID No.:</b> Not listed <b>2.5 CAS Registry No.:</b> 25321-22-6 <b>2.6 NAERG Guide No.:</b> 152 <b>2.7 Standard Industrial Trade Classification:</b> 51139
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Goggles, rubber gloves and self-contained breathing apparatus. <b>3.2 Symptoms Following Exposure:</b> INHALATION: Causes headache, drowsiness, unsteadiness. Irritating to mucous membranes. EYES: Severe irritation. SKIN: Severe irritation. INGESTION: Irritation of gastric mucosa, nausea, vomiting, diarrhea, abdominal cramps and cyanosis. <b>3.3 Treatment of Exposure:</b> Get medical aid. INHALATION: Remove from exposure. Keep quiet and warm. EYES: Rinse with running water for 15 to 20 minutes. SKIN: Wash with soap and water. INGESTION: Wash mouth, give emetic. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 500 to 5000 mg/kg. <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> May cause some liver and kidney damage. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. <b>3.12 Odor Threshold:</b> .02 ppm in water. <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** (est.) 165°F O.C. 151°F C.C.  
**4.2 Flammable Limits in Air:** (est.) 2.02% - 9.2%.  
**4.3 Fire Extinguishing Agents:** Water, foam, carbon dioxide or dry or dry chemical.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion Products:** Irritating vapors including hydrogen chloride are produced.  
**4.6 Behavior in Fire:** Not pertinent  
**4.7 Auto Ignition Temperature:** (est.) 1198°F.  
**4.8 Electrical Hazards:** None  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** 10 ppm/48-hour/Zebrafish/LC<sub>50</sub>.  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: Z  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Currently not available  
**7.2 Storage Temperature:** Currently not available  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** B  
**7.6 Ship Type:** 2  
**7.7 Barge Hull Type:** 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed  
**8.2 49 CFR Class:** Not pertinent  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** Yes  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** 100 pounds  
**8.7 EPA Pollution Category:** B  
**8.8 RCRA Waste Number:** U071  
**8.9 EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 147.01.  
**9.3 Boiling Point at 1 atm:** 343.4°F = 173°C = 446.15°K  
**9.4 Freezing Point:** -12.5°F = 24.7°C = 248.45°K.  
**9.5 Critical Temperature:** (est.) 771.44°F = 410.8°C = 683.95°K.  
**9.6 Critical Pressure:** 562.9 psia = 38.3 atm = 3.88 NM/m<sup>2</sup>  
**9.7 Specific Gravity:** 1.2884 at 20°C.  
**9.8 Liquid Surface Tension:** 36.01 dynes/cm = 0.03601 N/m at 20°C.  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** 5.07.  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** At boiling point. 113.02 Btu/lb = 62.79 cal/g = 2.63 X 10<sup>5</sup>  
**9.13 Heat of Combustion:** (net) -8096 Btu/lb = 4498 cal/g = -1.88 X 10<sup>7</sup> J/kg.  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** 20.55 cal/g  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# M-DICHLOROBENZENE

DBM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
15	79.492	C U R R E N T L Y  N O T  A V A I L A B L E					C U R R E N T L Y  N O T  A V A I L A B L E
20	79.485						
25	79.476						
30	79.467						
35	79.459						
40	79.450						
45	79.441						
50	79.433						
55	79.424						
60	79.417						
65	79.408						
70	79.400						
75	79.391						
80	79.382						
85	79.374						
90	79.365						
95	79.356						
100	79.349						
105	79.339						
110	79.332						
115	79.323						
120	79.315						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		55	0.021	55	0.48431	625	0.305
		60	0.024	60	0.55781	650	0.311
		65	0.029	65	0.64247	675	0.317
		70	0.033	70	0.73998	700	0.322
		75	0.039	75	0.85228	725	0.328
		80	0.045	80	0.98163	750	0.333
		85	0.053	85	1.13061	775	0.339
		90	0.062	90	1.30220	800	0.344
		95	0.072	95	1.49983	825	0.350
		100	0.084	100	1.72745	850	0.356
		105	0.098	105	1.98962	875	0.361
		110	0.115	110	2.29158	900	0.367
		115	0.134	115	2.63937	925	0.372
		120	0.157	120	3.03994	950	0.378
		125	0.183	125	3.50130	975	0.383
		130	0.213	130	4.03269	1000	0.389
		135	0.249	135	4.64471	1025	0.395
		140	0.291	140	5.34963	1050	0.400
		145	0.339	145	6.16152	1075	0.406
		150	0.396	150	7.09664	1100	0.411
						1125	0.417
						1150	0.422
						1175	0.428
						1200	0.434
						1225	0.439
						1250	0.445

# DIBENZYL ETHER

DBN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzyl ether 1,1'-[Oxybis(methylene)] bis benzene		Liquid	Colorless	Mild odor
		May float or sink in water.		
Keep people away. Shut off ignition sources. Call fire department. Avoid contact with liquid.				
<b>Fire</b>	Combustible Water and foam may be ineffective on fire. Extinguish with dry chemicals or carbon dioxide			
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_{12}H_{10}O$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 103-50-4
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Inhalation may cause nausea because of disagreeable odor. Contact of liquid with eyes causes mild irritation. Prolonged exposure of skin to liquid causes reddening and irritation. Ingestion produces nausea.
- 3.3 Treatment of Exposure: EYES: Flush with water for at least 15 minutes. SKIN: Wipe off, wash with soap and water. INGESTION: Induce vomiting and get medical attention.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $LD_{50} = 2.5$  g/kg (rat)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 275°F C.C.
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 80.9 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 21.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99%
- 7.2 Storage Temperature: Currently not available
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not Listed
- 8.2 49 CFR Class: Not Pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 198.26
- 9.3 Boiling Point at 1 atm: 568°F = 298°C = 571°K
- 9.4 Freezing Point: 38.5°F = 3.6°C = 277°K
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 1.0428 at 20°C
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: 6.84
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Currently not available
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# DIBENZYL ETHER

DBN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	65.100		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	35 40 45 50 55 60 65 70 75 80 85 90 95 100	9.672 8.490 7.571 6.835 6.234 5.732 5.308 4.944 4.629 4.353 4.110 3.894 3.700 3.526

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.234 0.245 0.255 0.266 0.277 0.287 0.298 0.309 0.320 0.330 0.341 0.352 0.362 0.373 0.384 0.395 0.405 0.416 0.427 0.437 0.448 0.459 0.470 0.480 0.491

# O-DICHLOROBENZENE

DBO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Dichlorobenzene ortho-Dichlorobenzene Dowtherm e	Liquid  Colorless  Pleasant odor  Sinks in water.
Avoid contact with liquid. Wear goggles and self-contained breathing apparatus. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Do not burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 36; Halogenated hydrocarbon  
2.2 **Formula:** o-C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub>  
2.3 **IMO/UN Designation:** 6.1/1591  
2.4 **DOT ID No.:** 1591  
2.5 **CAS Registry No.:** 95-50-1  
2.6 **NAERG Guide No.:** 152  
2.7 **Standard Industrial Trade Classification:** 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor-acid gas respirator; neoprene or vinyl gloves; chemical safety spectacles, face shield, rubber footwear, apron, protective clothing.
- 3.2 **Symptoms Following Exposure:** Chronic inhalation of mist or vapors may result in damage to lungs, liver, and kidneys. Acute vapor exposure can cause symptoms ranging from coughing to central nervous system depression and transient anesthesia. Irritating to skin, eyes, and mucous membranes. May cause dermatitis.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air, keep him quiet and warm, and call a physician promptly. INGESTION: no known antidote; treat symptomatically; induce vomiting and get medical attention promptly. EYES AND SKIN: flush with plenty of water; get medical attention for eyes; remove contaminated clothing and wash before reuse.
- 3.4 **TLV-TWA:** 25 ppm  
3.5 **TLV-STEL:** 50 ppm  
3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes kidney and liver damage in rats. Effects unknown in humans.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 4.0 ppm; 50 ppm  
3.13 **IDLH Value:** 200 ppm  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 50 ppm  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 165°F O.C. 155°F C.C.  
4.2 **Flammable Limits in Air:** 2.2%-9.2%  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Poisonous vapors including hydrogen chloride gas, chlorocarbons, chlorine  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 1198°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 1.3 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 13 ppm/marine plankton/no growth/ salt water  
\*Time period not specified.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** <0.1% (theor.), 1/8 day  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 99.5% min. dichlorobenzene (ratio-ortho + para/meta: 80 min.) Technical: 85% orthodichlorobenzene, 14.0% paradichlorobenzene Technical: 80% ortho, 17% para, 2% meta Pure: not less than 99.5% ortho, not more than 0.5% para  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U070  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 147.01  
9.3 **Boiling Point at 1 atm:** 356.9°F = 180.5°C = 453.7°K  
9.4 **Freezing Point:** 0.3°F = 17.6°C = 255.6°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.306 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 37 dynes/cm = 0.037 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.080  
9.12 **Latent Heat of Vaporization:** 115 Btu/lb = 63.9 cal/g = 2.68 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -7969 Btu/lb = -4427 cal/g = -185.4 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 21.02 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.06 psia

### NOTES

# O-DICHLOROBENZENE

DBO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	81.799	40	0.271	30	0.866	32	1.041
61	81.770	50	0.273	35	0.863	34	1.021
62	81.730	60	0.275	40	0.859	36	1.001
63	81.700	70	0.276	45	0.856	38	0.982
64	81.660	80	0.278	50	0.853	40	0.964
65	81.629	90	0.280	55	0.850	42	0.945
66	81.589	100	0.281	60	0.847	44	0.928
67	81.559	110	0.283	65	0.844	46	0.911
68	81.520	120	0.285	70	0.840	48	0.894
69	81.490	130	0.286	75	0.837	50	0.878
70	81.450	140	0.288	80	0.834	52	0.862
71	81.419	150	0.290	85	0.831	54	0.846
72	81.389	160	0.291	90	0.828	56	0.831
73	81.349	170	0.293	95	0.825	58	0.817
74	81.320	180	0.295	100	0.821	60	0.802
75	81.280	190	0.296	105	0.818	62	0.788
76	81.250	200	0.298	110	0.815	64	0.775
77	81.209	210	0.300	115	0.812	66	0.762
				120	0.809		
				125	0.806		
				130	0.803		
				135	0.799		
				140	0.796		
				145	0.793		
				150	0.790		
				155	0.787		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.015	40	0.009	40	0.00024	0	0.162
		50	0.013	50	0.00034	25	0.169
		60	0.018	60	0.00047	50	0.177
		70	0.025	70	0.00065	75	0.184
		80	0.035	80	0.00088	100	0.191
		90	0.048	90	0.00118	125	0.198
		100	0.064	100	0.00157	150	0.205
		110	0.085	110	0.00207	175	0.211
		120	0.114	120	0.00270	200	0.218
		130	0.150	130	0.00348	225	0.224
		140	0.195	140	0.00446	250	0.230
		150	0.252	150	0.00565	275	0.236
		160	0.322	160	0.00712	300	0.241
		170	0.409	170	0.00889	325	0.247
		180	0.515	180	0.01103	350	0.252
		190	0.644	190	0.01358	375	0.257
		200	0.801	200	0.01662	400	0.262
		210	0.988	210	0.02022	425	0.267
						450	0.272
						475	0.276
						500	0.280
						525	0.285
						550	0.289
						575	0.292
						600	0.296

# P-DICHLOROBENZENE

DBP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dichloride Paradi Paradichlorobenzene Paradow Paramoth Santochlor	Solid crystals  White to clear  Mothballs odor  Sinks in water.
Avoid contact with solid. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Do not burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 36; Halogenated hydrocarbon  
2.2 Formula: p-Cl<sub>2</sub>H<sub>6</sub>  
2.3 IMO/UN Designation: 9.0/1592  
2.4 DOT ID No.: 1592  
2.5 CAS Registry No.: 106-46-7  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full face mask fitted with organic vapor canister for concentrations over 75 ppm; clean protective clothing; eye protection.  
3.2 **Symptoms Following Exposure:** INHALATION: irritation of upper respiratory tract; over-exposure may cause depression and injury to liver and kidney. EYE CONTACT: pain and mild irritation.  
3.3 **Treatment of Exposure:** INHALATION: if any ill effects develop, remove patient to fresh air and get medical attention. If breathing stops, give artificial respiration. EYES: flush with plenty of water and get medical attention if ill effects develop. SKIN AND INGESTION: no problem likely.  
3.4 TLV-TWA: 10 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 15-30 ppm  
3.13 **IDLH Value:** 150 ppm  
3.14 **OSHA PEL-TWA:** 75 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 165°F O.C. 150°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide or dry chemical.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Vapors are irritating. Toxic chlorine, hydrogen chloride, and phosgene gases may be generated in fires.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 1.3 mm/min. (approx.)  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
50 ppm\*/fish/lethal/fresh water  
880 mg/1/48 hr/rainbow trout/TL<sub>50</sub>/fresh water  
\*No time interval specified  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: Z  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Solid: 5 grades, chemical purity close to 100% Liquid: 1-2% orthodichlorobenzene.  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U072  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 147.01  
9.3 **Boiling Point at 1 atm:** 345.6°F = 174.2°C = 447.4°K  
9.4 **Freezing Point:** 130°F = 53°C = 326°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.458 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 29.07 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# P-DICHLOROBENZENE

DBP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T	136 138 140 142 144 146 148 150 152 154 156 158 160 162 164 166 168 170 172 174 176 178 180 182 184 186	0.757 0.756 0.755 0.754 0.753 0.752 0.751 0.750 0.749 0.748 0.747 0.746 0.745 0.744 0.743 0.742 0.741 0.739 0.738 0.737 0.736 0.735 0.734 0.733 0.732 0.731		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.008		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DECABORANE

DBR

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid White Sharp odor

Floats on water.

**KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.**  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  
Shut off ignition sources. Call fire department.  
Stay upwind. Use water spray to "knock down" vapor.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

FLAMMABLE.  
POISONOUS GASES MAY BE PRODUCED IN FIRE.  
Containers may explode in fire.  
Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).  
Extinguish with water, dry chemicals, foam, or carbon dioxide.  
Do not use vaporizing liquids on fire.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
POISONOUS IF INHALED OR IF SKIN IS EXPOSED.  
Move victim to fresh air.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing is difficult, give oxygen.

SOLID  
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Do not burn

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $B_{10}H_{14}$   
2.3 IMO/UN Designation: 4.1/1868  
2.4 DOT ID No.: 1868  
2.5 CAS Registry No.: 17702-41-9  
2.6 NAERG Guide No.: 134  
2.7 Standard Industrial Trade Classification: 52495

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus or positive-pressure hose mask; rubber boots or overshoes; clothing made of material resistant to decaborane; rubber gloves; chemical-type goggles or face shield.
- 3.2 **Symptoms Following Exposure:** (The onset of symptoms is frequently delayed until one or two days after exposure.) Inhalation or ingestion causes headache, nausea, light-headedness, drowsiness, nervousness, lack of coordination, and tremor; muscle spasms and generalized convulsions may occur. Dust irritates eyes and skin and may give same systemic symptoms as for inhalation if left on skin.
- 3.3 **Treatment of Exposure:** Get medical attention after all exposures to this compound. Symptoms may be delayed for 48 hours. INHALATION: move patient to fresh air; keep him warm and quiet. EYES: flush with water for at least 15 min. SKIN: immediately wash with soap and plenty of water. INGESTION: if victim is conscious, give a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Note to physician: Treat symptomatically; administration of methocarbamol or other muscle relaxant may be helpful immediately following exposure and in the absence of symptoms.
- 3.4 TLV-TWA: 0.05 ppm  
3.5 TLV-STEL: 0.15 ppm  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; oral  $LD_{50}$  = 40 mg/kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** 0.05 ppm  
3.13 **IDLH Value:** 15 mg/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 0.05 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
(Flammable solid) 176°F C.C.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, and carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Halogenated extinguishing agents.
- 4.5 **Special Hazards of Combustion Products:** May give toxic fumes of unburned material.
- 4.6 **Behavior in Fire:** May explode when hot. Burns with a green-colored flame.
- 4.7 **Auto Ignition Temperature:** 300°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly to form flammable hydrogen gas, which can accumulate in closed area.
- 5.2 **Reactivity with Common Materials:**  
Corrosive to natural rubber, some synthetic rubbers, some greases, and some lubricants.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with 3% aqueous ammonia solution, then with water. Methyl alcohol may also be used.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 95+% High purity: 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable solid  
8.2 **49 CFR Class:** 4.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 122.3  
9.3 **Boiling Point at 1 atm:** 415°F = 213°C = 486°K  
9.4 **Freezing Point:** 210°F = 99°C = 372°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.94 at 25°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -28,699 Btu/lb = -15,944 cal/g = -667.10 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** -279 Btu/lb = -155 cal/g = -6.49 X 10<sup>3</sup> J/kg  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# DECABORANE

DBR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210	0.000 0.000 0.000 0.001 0.001 0.002 0.003 0.006 0.009 0.015 0.023 0.035 0.053 0.080 0.118 0.173 0.250 0.357	60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210	0.00001 0.00002 0.00003 0.00004 0.00007 0.00011 0.00018 0.00028 0.00043 0.00066 0.00098 0.00145 0.00211 0.00303 0.00432 0.00607		N O T  P E R T I N E N T

# DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT

DBS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Triethanolamine dodecylbenzenesulfonate	Liquid  Yellowish brown  Sinks and mixes with water.
Keep people away. Avoid contact with liquid. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, foam or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{12}H_{25}SO_3HN(CH_2CH_2OH)_3 \cdot H_2O$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; face mask or goggles  
3.2 **Symptoms Following Exposure:** Ingestion may cause irritation of mouth and stomach. Contact with eyes or prolonged contact with skin may cause irritation.  
3.3 **Treatment of Exposure:** INGESTION: give large amount of water; consult a doctor if large amount was ingested. EYES: flush with water; consult a doctor if irritation persists. SKIN: flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion**  
Products: Toxic oxides of nitrogen and irritating oxides of sulfur may form in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 60% solution in water  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 475.6 (solute)  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) 1.2 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT

DBS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	74.910		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DIBUTYLPHENOL

DBT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,6-Di-tert-butylphenol	Solid or liquid Colorless to light yellow Odorless  Floats on water. Freezing point is 97°F.
Keep people away. Avoid contact with liquid and solid. Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  LIQUID OR SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 2, 6-(t-C<sub>4</sub>H<sub>9</sub>)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>OH  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 26746-39-3  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51243

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Irritates eyes and (on prolonged contact) skin. Ingestion causes irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min. SKIN: wipe off, wash well with soap and water. INGESTION: induce vomiting; get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> (2, 6-Di-sec-butyl phenol) = 1.32 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
> 200°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 90.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 25.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient (solid); 100°F (liquid)  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 206.3  
9.3 **Boiling Point at 1 atm:** 487°F = 253°C = 526°K  
9.4 **Freezing Point:** 97°F = 36°C = 309°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.914 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -18,000 Btu/lb = -9,800 cal/g = -410 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIBUTYLPHENOL

DBT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DIISOBUTYLAMINE

DBU

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> N,N-bis(2-Methylpropyl)amine 1-Propanamine, 2-methyl-N-(2-methyl propyl)-	Liquid  Colorless  Ammonia  Floats and slowly mixes with water.
Keep people away. Avoid contact with liquid and vapor. Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources. Call fire department. Stay upwind and use water spray to knock down vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE. Containers may explode in fire. Vapor may explode if ignited in enclosed area. Flash back along vapor trail may occur. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or fog; large fires: water spray, fog or foam. Cool exposed containers with water from the site until well after the fire is out.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, throat. If in eyes, hold eyelids open and flush with running water for at least 15 min. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove and isolate contaminated clothing and shoes at the site. IF IN EYES OR ON SKIN, flush with running water for at least 15 min.; hold eyelids open if necessary. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: T; Aliphatic amines  
2.2 Formula:  $((CH_3)_2CHCH_2)_2NH$   
2.3 IMO/UN Designation: 3.3/2361  
2.4 DOT ID No.: 2361  
2.5 CAS Registry No.: 110-96-3  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.  
3.2 **Symptoms Following Exposure:** Inhalation of high concentrations of vapor will cause irritation of the respiratory tract and the lungs. Contact with liquid may result in severe skin and eye irritation. Exposure to concentrated vapors may result in corneal edema. Poisonous if swallowed.  
3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If victim is conscious, have victim drink water or milk and have victim induce vomiting. If victim is unconscious or having convulsions, do nothing except keep victim warm.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 258 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 85°F. C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or fog; large fires: water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may not be effective.  
4.5 **Special Hazards of Combustion Products:** May contain toxic NO<sub>x</sub> fumes.  
4.6 **Behavior in Fire:** Can react vigorously with oxidizing materials. Produces toxic and irritating gases.  
4.7 **Auto Ignition Temperature:** 554°F.  
4.8 **Electrical Hazards:** Class 1; Group C  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 65.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 18.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Incompatible with aluminum or aluminum alloys; copper or copper alloys; zinc, galvanized steel or alloys having more than 10% zinc by weight; mercury.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 20-40 ppm/24 hr critical range/creek chub, minnows  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%; 98%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirements  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** (C)  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 129.25  
9.3 **Boiling Point at 1 atm:** 283.1°F = 139.5°C = 412.7°K  
9.4 **Freezing Point:** -94°F = -70°C = 203.2°K  
9.5 **Critical Temperature:** 538 °F. = 281.3 °C. = 554.5 °K.  
9.6 **Critical Pressure:** 370 psia = 25.16 atm = 2.55 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.745 at 20° C.  
9.8 **Liquid Surface Tension:** 22.58 dynes/cm = 0.02258 N/m at 15.1°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.46  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 140 Btu/lb = 77.8 cal/g = 3.26 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -73.31 +/- 1.49 Btu/lb = -40.73 +/- 0.83 cal/g = -1.71 +/- 0.03 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# DIISOBUTYLAMINE

DBU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	46.500		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	77	0.738

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.500	25 50 75 100 125 150 175 200 225 250 275	0.011 0.072 0.214 0.463 0.845 1.380 2.090 2.994 4.111 5.460 7.057	25 50 75 100 125 150 175 200 225 250 275	0.00029 0.00168 0.00465 0.00959 0.01682 0.02661 0.03922 0.05488 0.07381 0.09621 0.12669		C U R R E N T L Y  N O T  A V A I L A B L E

# N-DECYL BENZENE

DBZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Decylbenzene 1-Phenyldecane		Liquid White  Floats on water.
Keep people away. Shut off ignition sources. Call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. Extinguish with dry chemicals or carbon dioxide. Water and foam may be ineffective on fire. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. DO NOT INDUCE VOMITING.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 32; Aromatic Hydrocarbon  
2.2 **Formula:** C<sub>11</sub>H<sub>22</sub>(CH<sub>2</sub>)<sub>9</sub>CH<sub>3</sub>  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not pertinent  
2.5 **CAS Registry No.:** Not pertinent  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Inhalation of vapor causes slight irritation of nose and throat. Aspiration of liquid into lungs causes coughing, distress, and pulmonary edema. Ingestion causes irritation of stomach. Contact with vapor or liquid causes irritation of eyes and mild irritation of skin.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water. SKIN: wipe off; flush with water; wash with soap and water. ASPIRATION: enforced bed rest; administer oxygen; call a doctor.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 225°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 5.04 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 107.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 29.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May attack some forms of plastics.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 218  
9.3 **Boiling Point at 1 atm:** 572°F = 300°C = 573°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.855 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 29.95 dynes/cm = 0.02995 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 103.8 Btu/lb = 57.67 cal/g = 2.413 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -18,400 Btu/lb = -10,200 cal/g = -427 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Not pertinent  
9.18 **Limiting Value:** Not pertinent  
9.19 **Reid Vapor Pressure:** Not pertinent

### NOTES

# N-DECYL BENZENE

DBZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	53.430	42	0.340	42	1.048	52	4.669
36	53.420	44	0.340	44	1.048	54	4.546
38	53.420	46	0.340	46	1.048	56	4.427
40	53.410	48	0.340	48	1.048	58	4.311
42	53.410	50	0.340	50	1.048	60	4.200
44	53.400	52	0.340	52	1.048	62	4.092
46	53.400	54	0.340	54	1.048	64	3.988
48	53.390	56	0.340	56	1.048	66	3.887
50	53.390	58	0.340	58	1.048	68	3.790
52	53.380	60	0.340	60	1.048	70	3.696
54	53.380	62	0.340	62	1.048	72	3.604
56	53.370	64	0.340	64	1.048	74	3.516
58	53.370	66	0.340	66	1.048	76	3.431
60	53.370	68	0.340	68	1.048	78	3.348
62	53.360	70	0.340	70	1.048	80	3.267
64	53.360	72	0.340	72	1.048	82	3.190
66	53.350	74	0.340	74	1.048	84	3.114
68	53.350	76	0.340	76	1.048	86	3.041
70	53.340					88	2.970
72	53.340					90	2.902
74	53.330					92	2.835
76	53.330					94	2.771
78	53.320					96	2.708
80	53.320					98	2.647
82	53.310					100	2.588
84	53.310					102	2.531

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	400	1.268	400	0.02995		N
	N	410	1.518	410	0.03545		O
	S	420	1.808	420	0.04175		T
	O	430	2.143	430	0.04892		
	L	440	2.528	440	0.05706		P
	U	450	2.967	450	0.06624		E
	B	460	3.468	460	0.07657		R
	L	470	4.035	470	0.08814		T
	E	480	4.676	480	0.10110		I
		490	5.398	490	0.11540		N
		500	6.207	500	0.13130		E
		510	7.112	510	0.14890		N
		520	8.120	520	0.16830		T
		530	9.239	530	0.18960		
		540	10.480	540	0.21290		
		550	11.850	550	0.23830		
		560	13.360	560	0.26600		
		570	15.010	570	0.29610		

# 2,4-DICHLOROPHENOXYACETIC ACID

DCA

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms 2,4-D	Solid	White to tan	Odorless
	Sinks in water.		
Keep people away. Notify local health and pollution control agencies. Protect water intakes.			
Fire	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Flood discharge area with water.		
Exposure	CALL FOR MEDICAL AID.  SOLID POISONOUS IF SWALLOWED. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 2, 4-Cl<sub>2</sub>C<sub>6</sub>H<sub>3</sub>OCH<sub>2</sub>COOH  
2.3 IMO/UN Designation: 6.1/1609  
2.4 DOT ID No.: 2765  
2.5 CAS Registry No.: 94-75-7  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification: 51379

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Protective dust mask; rubber gloves; chemical goggles.  
3.2 Symptoms Following Exposure: Dust may irritate eyes. Ingestion causes gastroenteric distress, diarrhea, mild central nervous system depression, dysphagia, and possible transient liver and kidney injury.  
3.3 Treatment of Exposure: EYES: flush with water for at least 15 min. SKIN: wash well with soap and water. INGESTION: induce vomiting and follow with gastric lavage and supportive therapy.  
3.4 TLV-TWA: 10 mg/m<sup>3</sup>  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3; oral rat LD<sub>50</sub> = 375 mg/kg (rat), 80 mg/kg (human)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Causes birth defects in some laboratory animals  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: 100 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 10 mg/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent (combustible solid)  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Water, foam  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Toxic and irritating hydrogen chloride or phosgene gases may form.  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 35.7 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 12.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with sodium bicarbonate or lime solution.  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 5 ppm/48 hr/killfish/50% kill/salt water  
375 mg/l/48 hr/bluegill/TL<sub>96</sub>/fresh water  
6.2 Waterfowl Toxicity: LD<sub>50</sub> approximately 2,000 mg/kg  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: No buildup in food chain  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 98+%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: A  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 221.0  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: 286°F = 141°C = 314°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.563 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -7,700 Btu/lb = -4,300 cal/g = -180 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# 2,4-DICHLOROPHENOXYACETIC ACID

DCA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.070		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DICHLOROBUTENE

DCB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Butylene dichloride 1,4-Dichloro-2-butene cis-1,4-Dichloro-2-butene trans-1,4-Dichloro-2-butene 1,4-Dichloro-2-butylene	Liquid  Colorless  Sweet odor  Sinks and mixes slowly with water.
Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump Chemical and Physical Treatment: Neutralize Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $\text{ClCH}_2\text{CH}=\text{CHCH}_2\text{Cl}$ 2.3 IMO/UN Designation: 8/1760 2.4 DOT ID No.: 2920 2.5 CAS Registry No.: 764-41-0 2.6 NAERG Guide No.: 132 2.7 Standard Industrial Trade Classification: 51138
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Rubber gloves; chemical splash goggles; rubber boots and apron; barrier cream; organic canister mask. 3.2 <b>Symptoms Following Exposure:</b> Inhalation of vapor irritates nose and throat. Contact with eyes causes intense irritation and tears. Contact of liquid with skin causes severe blistering and dermatitis. Ingestion causes severe irritation of mouth and stomach. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove from exposure; provide low-pressure oxygen if required; keep under observation until edema is ruled out. EYES: irrigate immediately for 15 min.; call physician. SKIN: wash immediately and thoroughly with soap and water; treat as a chemical burn. INGESTION: induce vomiting; call physician. 3.4 TLV-TWA: 0.005 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 3; oral $\text{LD}_{50} = 89 \text{ mg/kg (rat)}$ 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** 1.5%-4%  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Decomposition vapors contain phosgene and hydrogen chloride gases; both are toxic and irritating.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 2.6 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 23.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly to form hydrochloric acid.  
5.2 **Reactivity with Common Materials:** Corrodes metal when wet.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Cis-trans equilibrium mixture, 98+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1 pound  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** U074  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 125.0  
9.3 **Boiling Point at 1 atm:** 313°F = 156°C = 429°K  
9.4 **Freezing Point:** cis: -54°F = -48°C = 225°K  
trans: 37°F = 3°C = 276°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.112 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 24 dynes/cm = 0.024 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0874  
9.12 **Latent Heat of Vaporization:** (est.) 130 Btu/lb = 73 cal/g = 3.1 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -17,500 Btu/lb = -9,720 cal/g = -407 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# DICHLOROBUTENE

DCB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	70.179	42	0.386	51	1.048	51	1.249
44	70.110	44	0.387	52	1.048	52	1.238
46	70.040	46	0.388	53	1.048	53	1.227
48	69.969	48	0.389	54	1.048	54	1.216
50	69.900	50	0.390	55	1.048	55	1.205
52	69.830	52	0.391	56	1.048	56	1.194
54	69.759	54	0.392	57	1.048	57	1.184
56	69.700	56	0.393	58	1.048	58	1.173
58	69.629	58	0.394	59	1.048	59	1.163
60	69.559	60	0.396	60	1.048	60	1.153
62	69.490	62	0.397	61	1.048	61	1.143
64	69.419	64	0.398	62	1.048	62	1.133
66	69.349	66	0.399	63	1.048	63	1.123
68	69.280	68	0.400	64	1.048	64	1.113
70	69.209	70	0.401	65	1.048	65	1.104
72	69.139	72	0.402	66	1.048	66	1.094
74	69.070	74	0.403	67	1.048	67	1.085
76	69.000	76	0.404	68	1.048	68	1.076
78	68.929	78	0.406			69	1.066
80	68.860	80	0.407			70	1.057
82	68.790	82	0.408			71	1.048
84	68.719	84	0.409			72	1.040
		86	0.410			73	1.031
						74	1.022
						75	1.014
						76	1.006

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.200	180	1.166	180	0.02122	0	0.179
		185	1.307	185	0.02361	20	0.185
		190	1.463	190	0.02622	40	0.190
		195	1.634	195	0.02907	60	0.196
		200	1.823	200	0.03218	80	0.201
		205	2.030	205	0.03556	100	0.206
		210	2.257	210	0.03924	120	0.211
		215	2.505	215	0.04324	140	0.216
		220	2.777	220	0.04757	160	0.221
		225	3.073	225	0.05226	180	0.226
		230	3.395	230	0.05733	200	0.230
		235	3.747	235	0.06281	220	0.235
		240	4.128	240	0.06871	240	0.240
		245	4.543	245	0.07507	260	0.244
		250	4.992	250	0.08191	280	0.248
		255	5.479	255	0.08927	300	0.253
		260	6.005	260	0.09716	320	0.257
		265	6.573	265	0.10560	340	0.261
		270	7.186	270	0.11470	360	0.266
		275	7.847	275	0.12440	380	0.270
		280	8.559	280	0.13470	400	0.274
		285	9.324	285	0.14580	420	0.278
		290	10.150	290	0.15760	440	0.281
		295	11.030	295	0.17020		
		300	11.970	300	0.18350		
		305	12.990	305	0.19770		

# DECANE

DCC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Decane	Liquid	Colorless	None
Floats on water.			
<b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Keep people away. Wear rubber over clothing (including gloves), goggles, and self-contained breathing apparatus. Evacuate area. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	COMBUSTIBLE. Wear full protective clothing and approved self-contained breathing apparatus with full facepiece. Extinguish with dry chemical, CO <sub>2</sub> , or foam. Water fog or spray may be used to cool exposed containers. Do not spray water directly on fire; material floats and may reignite.		
<b>Exposure</b>	CALL FOR MEDICAL AID. Move victim to fresh air. Remove contaminated clothing and shoes. Wash affected areas with plenty of soap and water. IF SWALLOWED, do not induce vomiting. If breathing is difficult, give oxygen.		
<b>Water Pollution</b>	Effects of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn;  
 Absorb  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula: CH<sub>3</sub>(CH<sub>2</sub>)<sub>8</sub>CH<sub>3</sub>  
 2.3 IMO/UN Designation: Not listed.  
 2.4 DOT ID No.: 2247  
 2.5 CAS Registry No.: 124-18-5  
 2.6 NAERG Guide No.: 128  
 2.7 Standard Industrial Trade Classification: 51114

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved self-contained respirator, safety glasses, impervious gloves, and chemical protective clothing.
- 3.2 **Symptoms Following Exposure:** Contact with eyes may produce mild irritation. Contact with skin may cause defatting, redness, scaling, and hair loss. Ingestion may cause diarrhea, slight central nervous system depression, difficulty in breathing and fatigue. Inhalation of high concentrations may cause rapid breathing, fatigue, headache, dizziness, and other CNS effects.
- 3.3 **Treatment of Exposure:** CALL FOR MEDICAL AID EYES: Flush with water at least 15 minutes.  
 SKIN: Wash thoroughly with soap and water. INHALATION: Remove from exposure. If breathing is difficult, give oxygen. INGESTION: Do not induce vomiting.
- 3.4 TLV-TWA: Not listed.  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 Toxicity by Ingestion: Currently not available.  
 3.8 Toxicity by Inhalation: Currently not available.  
 3.9 **Chronic Toxicity:** Continued skin contact may cause dermatitis and hair loss. Enhances carcinogenicity of known carcinogens and has demonstrated tumor promoting activity when tested dermally in mice.  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 IDLH Value: Not listed.  
 3.14 OSHA PEL-TWA: Not listed.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 115°F C.C.  
 4.2 **Flammable Limits in Air:** LEL: 0.82%; UEL: 5.4%.  
 4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or foam.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not spray water directly on fire - it will scatter and spread the fire.  
 4.5 **Special Hazards of Combustion Products:** May produce toxic fumes, including carbon monoxide.  
 4.6 **Behavior in Fire:** Currently not available  
 4.7 **Auto Ignition Temperature:** 410°F.  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 73.8 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 21.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure or technical grades.  
 7.2 **Storage Temperature:** Ambient.  
 7.3 **Inert Atmosphere:** No requirement.  
 7.4 **Venting:** Not listed.  
 7.5 **IMO Pollution Category:** B  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
 8.2 49 CFR Class: 3  
 8.3 49 CFR Package Group: III  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:
- |                           |                |
|---------------------------|----------------|
| Category                  | Classification |
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 3              |
- 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
 5.2 **Reactivity with Common Materials:** No reaction.  
 5.3 **Stability During Transport:** Stable.  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
 5.5 **Polymerization:** Will not polymerize.  
 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** Currently not available  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 0  
 Human Oral hazard: 1  
 Human Contact hazard: 0  
 Reduction of amenities: 0

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 142.29  
 9.3 **Boiling Point at 1 atm:** 345°F = 174°C = 447°K  
 9.4 **Freezing Point:** -22°F = -30°C = 243°K  
 9.5 **Critical Temperature:** Currently not available  
 9.6 **Critical Pressure:** Currently not available  
 9.7 **Specific Gravity:** 0.73 @ 60°F  
 9.8 **Liquid Surface Tension:** Currently not available  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** 4.9  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
 9.12 **Latent Heat of Vaporization:** Currently not available  
 9.13 **Heat of Combustion:** Currently not available  
 9.14 **Heat of Decomposition:** Currently not available  
 9.15 **Heat of Solution:** Currently not available  
 9.16 **Heat of Polymerization:** Not pertinent.  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# DECANE

DCC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	6.092		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	62 100	0.019 0.101	62 100	0.00049 0.00238		C U R R E N T L Y  N O T  A V A I L A B L E

# 1-DECENE

DCE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> alpha-Decene	Watery liquid Colorless Pleasant odor  Floats on water.
Keep people away. Avoid contact with liquid. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Currently not available; Olefin  
2.2 **Formula:**  $\text{CH}_2=\text{CH}(\text{CH}_2)_9\text{CH}_3$   
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister or air-supplied mask, goggles or face shield.  
3.2 **Symptoms Following Exposure:** Vapors may produce slight irritation of eyes and respiratory tract if present in high concentration. May also act as a slight anesthetic at high concentration.  
3.3 **Treatment of Exposure:** CONTACT WITH EYES OR SKIN: splashes in the eye should be removed by thorough flushing with water. Skin areas should be washed with soap and water. Contaminated clothing should be laundered before reuse.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Slight smarting of eyes and respiratory system at high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 128°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 455°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 6.0 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 71.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 20.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 95-99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 140.2  
9.3 **Boiling Point at 1 atm:** 339.1°F = 170.6°C = 443.8°K  
9.4 **Freezing Point:** -87.3°F = -66.3°C = 206.9°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.741 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 28 dynes/cm = 0.028 N/m at 22.7°C  
9.10 **Vapor (Gas) Specific Gravity:** 4.8  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.039  
9.12 **Latent Heat of Vaporization:** 119 Btu/lb = 65.9 cal/g =  $2.76 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -19,107 Btu/lb = -10,615 cal/g =  $-444.43 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1-DECENE

DCE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	46.980		C	30	0.947	40	0.969
50	46.700		U	40	0.937	50	0.895
60	46.430		R	50	0.928	60	0.829
70	46.160		R	60	0.919	70	0.771
80	45.890		E	70	0.909	80	0.718
90	45.620		N	80	0.900	90	0.671
100	45.350		T	90	0.891	100	0.628
110	45.080		L	100	0.881	110	0.590
120	44.810		Y	110	0.872	120	0.555
130	44.540			120	0.863	130	0.523
140	44.270		N	130	0.853	140	0.494
150	44.000		O	140	0.844	150	0.467
160	43.730		T	150	0.835	160	0.443
170	43.460			160	0.826	170	0.421
180	43.190		A	170	0.816	180	0.400
190	42.920		V	180	0.807	190	0.381
200	42.650		A	190	0.798	200	0.364
210	42.380		I	200	0.788	210	0.348
			L				
			A				
			B				
			L				
			E				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.028	70	0.00068	0	0.335
	N	80	0.039	80	0.00095	10	0.341
	S	90	0.055	90	0.00132	20	0.347
	O	100	0.077	100	0.00180	30	0.353
	L	110	0.106	110	0.00243	40	0.358
	U	120	0.144	120	0.00324	50	0.364
	B	130	0.193	130	0.00429	60	0.370
	L	140	0.258	140	0.00561	70	0.376
	E	150	0.340	150	0.00728	80	0.381
		160	0.445	160	0.00937	90	0.387
		170	0.577	170	0.01196	100	0.393
		180	0.742	180	0.01514	110	0.399
		190	0.946	190	0.01903	120	0.404
		200	1.199	200	0.02374	130	0.410
		210	1.508	210	0.02941	140	0.416
		220	1.884	220	0.03621	150	0.422
		230	2.339	230	0.04430	160	0.427
		240	2.886	240	0.05387	170	0.433
						180	0.439
						190	0.445
						200	0.450
						210	0.456
						220	0.462
						230	0.468
						240	0.473
						250	0.479

# DICHLORODIFLUOROMETHANE

DCF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arcton 6 Eskimon 12 F-12 Freon 12 Frigen 12 Genetron 12 Halon 122 Isotron 12 Ucon 12	Gas  Colorless  Faint odor  Visible vapor cloud is produced.
Notify local health and pollution control agencies. Avoid inhalation.	
<b>Fire</b>	Not flammable. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Not irritating to eyes, nose or throat. If inhaled, will cause dizziness, difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 36; Halogenated hydrocarbon  
2.2 **Formula:** CCl<sub>2</sub>F<sub>2</sub>  
2.3 **IMO/UN Designation:** 2.0/1028  
2.4 **DOT ID No.:** 1028  
2.5 **CAS Registry No.:** 75-71-8  
2.6 **NAERG Guide No.:** 126  
2.7 **Standard Industrial Trade Classification:** 51137

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, monogoggles.  
3.2 **Symptoms Following Exposure:** INHALATION: some narcosis when 10% in air is breathed.  
3.3 **Treatment of Exposure:** Remove patient to non-contaminated area and apply artificial respiration if breathing has stopped; call a physician immediately; oxygen may be given.  
3.4 **TLV-TWA:** 1,000 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Not pertinent  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** None, except at very high concentrations, which may irritate lungs.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 15,000 ppm  
3.14 **OSHA PEL-TWA:** 1,000 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not flammable  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not flammable  
4.5 **Special Hazards of Combustion Products:** Although nonflammable, dissociation products generated in a fire may be irritating or toxic.  
4.6 **Behavior in Fire:** Helps extinguish fire.  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Not pertinent  
6.2 **Waterfowl Toxicity:** Not pertinent  
6.3 **Biological Oxygen Demand (BOD):** Not pertinent  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard:  
Human Contact hazard: II  
Reduction of amenities:

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.5% (vol.)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Nonflammable gas  
8.2 **49 CFR Class:** 2.2  
8.3 **49 CFR Package Group:** Not pertinent.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** U075  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
9.2 **Molecular Weight:** 120.91  
9.3 **Boiling Point at 1 atm:** -21.6°F = -29.8°C = 243.4°K  
9.4 **Freezing Point:** -251.9°F = 157.7°C = 115.5°K  
9.5 **Critical Temperature:** 233.2°F = 111.8°C = 385°K  
9.6 **Critical Pressure:** 598 psia = 40.7 atm = 4.12 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.35 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 4.2  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.129  
9.12 **Latent Heat of Vaporization:** 140 Btu/lb = 77.9 cal/g = 3.26 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 132 psia

### NOTES

# DICHLORODIFLUOROMETHANE

DCF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T	-35 -30 -25	0.221 0.223 0.224		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	-45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80	13.380 15.240 17.310 19.600 22.120 24.880 27.910 31.220 34.820 38.740 43.000 47.600 52.580 57.940 63.710 69.900 76.540 83.639 91.230 99.320 107.900 117.099 126.799 137.099 148.000 159.599	-45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80	0.36340 0.40920 0.45920 0.51380 0.57310 0.63740 0.70690 0.78190 0.86270 0.94940 1.04200 1.14200 1.24800 1.36000 1.48100 1.60800 1.74300 1.88600 2.03600 2.19500 2.36200 2.53800 2.72300 2.91600 3.11800 3.33000	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.135 0.139 0.142 0.145 0.148 0.151 0.154 0.156 0.159 0.161 0.164 0.166 0.168 0.170 0.172 0.173 0.175 0.176 0.178 0.179 0.180 0.181 0.182 0.183 0.183

# 1,1-DICHLOROETHANE

DCH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlorinated hydrochloric ether Ethylidene chloride Ethylidene dichloride			
Oily liquid	Colorless	Chloroform like ethereal	
Sinks and mixes with water.			
Evacuate. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Flammable. POISONOUS GAS MAY BE PRODUCED IN FIRE OR WHEN HEATED. Containers may explode in fire. Wear goggles and self-contained breathing apparatus. Extinguish with alcohol foam, carbon dioxide, or dry chemical. Water may be ineffective on fire.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID If swallowed may cause nausea, vomiting and faintness. Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and induce vomiting.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 36; Halogenated hydrocarbon  
2.2 Formula: C<sub>2</sub>H<sub>2</sub>Cl<sub>2</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2362  
2.5 CAS Registry No.: 75-34-3  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51138

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** In areas of poor ventilation or high concentration, a self-contained breathing apparatus with full face mask should be worn. Chemical workers goggles, rubber gloves, and protective clothing should be worn.
- 3.2 **Symptoms Following Exposure:** INHALATION: Irritation of respiratory tract. Salivation, sneezing, coughing, dizziness, nausea, and vomiting. EYES: Irritation, lacrimation, and reddening of conjunctiva. SKIN: Irritation. Prolonged or repeated skin contact can produce a slight burn. INGESTION: Ingestion incidental to industrial handling is not considered to be a problem. Swallowing of substantial amounts could cause nausea, vomiting, faintness, drowsiness, cyanosis, and circulatory failure.
- 3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from contaminated area; keep warm and quiet. If breathing has stopped, give artificial respiration. Administer oxygen. EYES: Flush with large amounts of water or weak bicarbonate of soda solution. SKIN: Dilute with large amounts of water. Remove contaminated clothing. INGESTION: Attempt to empty stomach; dilute by administering fluids (tap water, soapy water, salt water, or milk).
- 3.4 TLV-TWA: 100 ppm.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat).  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Chronic exposure may cause liver damage and dermatitis. Animal experimentation has shown this compound to be slightly embryo-toxic and to retard fetal development.  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 3,000 ppm  
3.14 OSHA PEL-TWA: 100 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 57°F O.C.  
= 22°F C.C.  
4.2 Flammable Limits in Air: 5.6% to 11.4%  
4.3 Fire Extinguishing Agents: Alcohol foam, water, foam, CO<sub>2</sub>, dry chemical, carbon tetrachloride  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
4.5 Special Hazards of Combustion Products: When heated to decomposition emits highly toxic fumes to phosgene.  
4.6 Behavior in Fire: Explosion hazard  
4.7 Auto Ignition Temperature: 856°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 11.9 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 5.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Currently not available  
5.4 Neutralizing Agents for Acids and Caustics: Currently not available  
5.5 Polymerization: Currently not available  
5.6 Inhibitor of Polymerization: Currently not available

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
TL<sub>m</sub> (Marine pinperch) 250 to 275 mg/l 24-hour  
TL<sub>m</sub> Brine shrimp: 320 mg/l 24-hour  
TL<sub>m</sub> Pinperch: 160 mg/l  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD):  
Percent, 0.05 g/g for 10 days Percent, 0.002 g/g for 5 days  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: (1)  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Cool  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: D  
7.6 Ship Type: 3  
7.7 Barge Hull Type: 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  
Category Classification  
Health Hazard (Blue)..... 2  
Flammability (Red)..... 3  
Instability (Yellow)..... 0  
8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: U076  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 98.97  
9.3 Boiling Point at 1 atm: 135.14°F = 57.3°C = 330.5°K  
9.4 Freezing Point: -143.32°F = -97.4°C = 175.75°K  
9.5 Critical Temperature: 502.7°F = 261.5°C = 534.7°K  
9.6 Critical Pressure: 734.8 psia = 50 atm = 5.065 MN/m<sup>2</sup>  
9.7 Specific Gravity: 1.174 at 20°C  
9.8 Liquid Surface Tension: 24.75 dynes/cm = 0.02475 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 3.42  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.136 at 20°C (68°F)  
9.12 Latent Heat of Vaporization: 131.6 Btu/lb = 73.1 cal/g = 3.06 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -4,774 Btu/lb = -2,652 cal/g = -111 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 7.35 psia

### NOTES

# 1,1-DICHLOROETHANE

DCH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	75.198		C	35	0.804	35	0.617
40	74.929		U	40	0.799	40	0.595
45	74.660		R	45	0.795	45	0.574
50	74.389		R	50	0.791	50	0.555
55	74.120		E	55	0.786	55	0.537
60	73.851		N	60	0.782	60	0.520
65	73.580		T	65	0.778	65	0.504
70	73.311		L	70	0.773	70	0.489
75	73.042		Y	75	0.769	75	0.475
80	72.771			80	0.765	80	0.462
85	72.502		N	85	0.760	85	0.449
			O	90	0.756	90	0.437
			T	95	0.752	95	0.426
				100	0.747	100	0.415
			A	105	0.743	105	0.405
			V	110	0.739	110	0.395
			A			115	0.386
			I			120	0.377
			L				
			A				
			B				
			L				
			E				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.500	-70	-1.334	-100	0.07407		C
		-60	-1.944	-80	0.05000		U
		-50	-0.555	-60	0.02594		R
		-40	0.835	-40	0.00187		R
		-30	0.225	-20	0.02219		E
		-20	0.386	0	0.04626		N
		-10	0.996	20	0.07032		T
		0	1.607	40	0.09439		L
		10	2.217	60	0.11845		Y
		20	2.827	80	0.14252		
		30	3.438	100	0.16658		N
		40	4.048	120	0.19065		O
		50	4.658	140	0.21471		T
		60	5.269	160	0.23878		
		70	5.879				A
		80	6.489				V
		90	7.100				A
		100	7.710				I
		110	8.321				L
		120	8.931				A
		130	9.541				B
							L
							E

# 2,2'-DICHLOROISOPROPYL ETHER

DCI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bis (2-Chloroisopropyl) ether Ether, bis(2-chloro-1-methylethyl)	Liquid  Colorless   Sinks and mixes slowly with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear positive pressure breathing apparatus and special protective clothing. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear positive pressure breathing apparatus and special protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , waterspray, or foam; large fires: water spray, fog or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be fatal if inhaled. Highly irritating to upper respiratory tract. Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Poisonous if swallowed or absorbed through skin. IF IN EYES OR ON SKIN, flush with running water for at least 15 min; hold eyelids open if necessary. Remove contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 36; Halogenated hydrocarbons  
2.2 **Formula:** (C<sub>3</sub>H<sub>7</sub>Cl)<sub>2</sub>O  
2.3 **IMO/UN Designation:** 6.1/2490  
2.4 **DOT ID No.:** 2490  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear positive pressure breathing apparatus and special protective clothing.  
3.2 **Symptoms Following Exposure:** Highly irritating to the upper respiratory tract if inhaled. Contact with the liquid may cause irritation of the skin and eyes. May be fatal if inhaled, swallowed or absorbed through the skin.  
3.3 **Treatment of Exposure:** INHALATION: Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. INGESTION: If victim is conscious, induce vomiting by giving two glasses of water and have victim touch a finger to the back of the throat.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 240mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May cause mutagenic effects and liver and kidney damage.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor cause slight smarting of the eyes or respiratory system if present in high concentration. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to skin.  
3.12 **Odor Threshold:** 0.32 ppm (detection in water)  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 185°F. O.C.; 170°F.C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; Large fires: water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** May contain highly toxic hydrochloric acid and phosgene gas.  
4.6 **Behavior in Fire:** Generates highly toxic and irritating gases.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)  
4.12 **Flame Temperature:** Data not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Oxidizing materials  
5.3 **Stability During Transport:** Avoid high heat and oxidizing materials. Subject to peroxide formation if not handled properly.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95% (mixed isomers)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** U027  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 171.07  
9.3 **Boiling Point at 1 atm:** 369°F = 187.3°C = 460.5°K  
9.4 **Freezing Point:** -142.2 to -151.24°F = -96.8 to -101.8°C = 176.4 to 171.4°K  
9.5 **Critical Temperature:** 723°F = 384°C = 657°K (est.)  
9.6 **Critical Pressure:** 413 psia = 28.1 atm = 2.85 MN/m<sup>2</sup> (est.)  
9.7 **Specific Gravity:** 1.1122 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 5.9  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 19.8 Btu/lb = 11.0 cal/g = 4.60X10<sup>4</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# 2,2'-DICHLOROISOPROPYL ETHER

DCI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	69.420		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.170	100 125 150 175 200 225 250 275 300 325 350	0.030 0.084 0.197 0.404 0.753 1.306 2.136 3.332 5.002 7.269 10.274	100 125 150 175 200 225 250 275 300 325 350	0.00087 0.00230 0.00510 0.01000 0.01793 0.03000 0.04754 0.07210 0.10546 0.14962 0.20685		C U R R E N T L Y  N O T  A V A I L A B L E

# DICHLONE

DCL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,3-Dichloro-1,4-naphthoquinone Phygon Phygon-XL	Solid crystalline      Yellow  Sinks and mixes with water.
Keep people away. Avoid contact with solid. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, skin, nose, and throat. Move to fresh air. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.  SOLID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drinkwater or milk and induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> Not listed. <b>2.2 Formula:</b> C <sub>10</sub> H <sub>6</sub> Cl <sub>2</sub> O <sub>2</sub> <b>2.3 IMO/UN Designation:</b> 6.1/1609 (>10%); 9/1609 (<10%) <b>2.4 DOT ID No.:</b> Not listed <b>2.5 CAS Registry No.:</b> 117-80-6 <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 51629
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Self-contained breathing apparatus, rubber gloves, hats, suits, and boots. <b>3.2 Symptoms Following Exposure:</b> INHALATION: Irritation to mucous membrane. EYES: Irritation. SKIN: Irritation. INGESTION: Can cause CNS depression. <b>3.3 Treatment of Exposure:</b> Call a physician. EYES: Flush with water. SKIN: Wash. INGESTION: Gastric lavage for large doses. For small doses, give activated charcoal, follow in 3 to 4 hours with sodium sulfate cathartic. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg. <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> A 2-year rat feeding study had no effect on weight, longevity, or reproduction. Irritating to skin. May cause dermatitis. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Currently not available <b>3.11 Liquid or Solid Characteristics:</b> Currently not available <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** Not pertinent  
**4.2 Flammable Limits in Air:** Not pertinent  
**4.3 Fire Extinguishing Agents:** Currently not available  
**4.4 Fire Extinguishing Agents Not to Be Used:** Currently not available  
**4.5 Special Hazards of Combustion Products:** Highly toxic fumes are imminent.  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Not pertinent  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** Not pertinent  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Currently not available  
**5.6 Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
48-hour TL<sub>m</sub> - Bluegill = 0.12 ppm  
96-hour TL<sub>m</sub> - Trout = 0.074 ppm  
96-hour TL<sub>m</sub> - Catfish = 0.14 ppm  
96-hour LC<sub>50</sub> - Bluegill = 0.04 ppm  
**6.2 Waterfowl Toxicity:** Young mallards = >2000 mg/kg  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** None likely - susceptible to hydrolysis and decomposition.  
**6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Technical grade - 95%  
**7.2 Storage Temperature:** Currently not available  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed  
**8.2 49 CFR Class:** Not pertinent  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** 1 pound  
**8.7 EPA Pollution Category:** X  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Solid  
**9.2 Molecular Weight:** 227.06  
**9.3 Boiling Point at 1 atm:** Sublimes 527°F = 275°C = 548.15°K  
**9.4 Freezing Point:** Pure: 379.4°F = 193°C = 466.2°K Technical: 370.4°F = 188°C = 461.2°K  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** Currently not available  
**9.8 Liquid Surface Tension:** Not pertinent  
**9.9 Liquid Water Interfacial Tension:** Not pertinent  
**9.10 Vapor (Gas) Specific Gravity:** 7.84  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# DICHLONE

DCL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	N O T  P E R T I N E N T		S U B L I M E S	527	0.00083		C U R R E N T L Y  N O T  A V A I L A B L E

# DICHLOROMETHANE

DCM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methylene chloride Methylene dichloride	Watery liquid	Colorless	Sweet, pleasant odor
Sinks in water. Irritating vapor is produced.			
Keep people away. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea and dizziness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 36; Halogenated hydrocarbon  
2.2 Formula: CH<sub>2</sub>Cl<sub>2</sub>  
2.3 IMO/UN Designation: 9.0/1593  
2.4 DOT ID No.: 1593  
2.5 CAS Registry No.: 75-09-2  
2.6 NAERG Guide No.: 160  
2.7 Standard Industrial Trade Classification: 51138

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor canister mask, safety glasses, protective clothing.  
3.2 **Symptoms Following Exposure:** INHALATION: anesthetic effects, nausea and drunkenness.  
CONTACT WITH SKIN AND EYES: skin irritation, irritation of eyes and nose.  
3.3 **Treatment of Exposure:** INHALATION: remove from exposure. Give oxygen if needed. INGESTION: no specific antidote. CONTACT WITH SKIN AND EYES: remove contaminated clothing; wash skin or eyes if affected.  
3.4 **TLV-TWA:** 50 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 205-307 ppm  
3.13 **IDLH Value:** 2,300 ppm  
3.14 **OSHA PEL-TWA:** 25 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 125 ppm  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable under conditions likely to be encountered.  
4.2 **Flammable Limits in Air:** 12%-19%  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Dissociation products generated in a fire may be irritating or toxic.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 1184°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Not pertinent  
6.2 **Waterfowl Toxicity:** Not pertinent  
6.3 **Biological Oxygen Demand (BOD):** Not pertinent  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Aerosol grade; technical grade  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Inerted  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** U080  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 84.93  
9.3 **Boiling Point at 1 atm:** 104°F = 39.8°C = 313.0°K  
9.4 **Freezing Point:** -142°F = -96.7°C = 176.5°K  
9.5 **Critical Temperature:** 473.0°F = 245°C = 518.2°K  
9.6 **Critical Pressure:** 895 psia = 60.9 atm = 6.17 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.322 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.9  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.199  
9.12 **Latent Heat of Vaporization:** 142 Btu/lb = 78.7 cal/g = 3.30 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 16.89 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 13.9 psia

### NOTES

# DICHLOROMETHANE

DCM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-70	91.320	35	0.274	-110	1.205		N O T  P E R T I N E N T
-60	90.700	40	0.275	-100	1.192		
-50	90.080	45	0.276	-90	1.179		
-40	89.450	50	0.277	-80	1.166		
-30	88.830	55	0.278	-70	1.154		
-20	88.200	60	0.279	-60	1.141		
-10	87.580	65	0.279	-50	1.128		
0	86.959	70	0.280	-40	1.115		
10	86.330	75	0.281	-30	1.102		
20	85.709	80	0.282	-20	1.090		
30	85.080	85	0.283	-10	1.077		
40	84.459	90	0.284	0	1.064		
50	83.830	95	0.284	10	1.051		
60	83.209	100	0.285	20	1.038		
70	82.589			30	1.025		
80	81.959			40	1.013		
90	81.341			50	1.000		
100	80.709			60	0.987		
				70	0.974		
				80	0.961		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.380	-10	0.866	-10	0.01525	0	0.126
		-5	1.013	-5	0.01763	10	0.129
		0	1.180	0	0.02031	20	0.131
		5	1.370	5	0.02333	30	0.133
		10	1.586	10	0.02671	40	0.135
		15	1.830	15	0.03050	50	0.137
		20	2.105	20	0.03472	60	0.139
		25	2.414	25	0.03941	70	0.142
		30	2.762	30	0.04462	80	0.144
		35	3.151	35	0.05039	90	0.145
		40	3.585	40	0.05676	100	0.147
		45	4.068	45	0.06378	110	0.149
		50	4.606	50	0.07149	120	0.151
		55	5.201	55	0.07996	130	0.153
		60	5.860	60	0.08922	140	0.155
		65	6.588	65	0.09934	150	0.156
		70	7.389	70	0.11040	160	0.158
		75	8.270	75	0.12240	170	0.159
		80	9.237	80	0.13540	180	0.161
		85	10.300	85	0.14960	190	0.163
						200	0.164
						210	0.165
						220	0.167
						230	0.168
						240	0.169
						250	0.171

# DECANOIC ACID

DCO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Capric acid Caprinic acid n-Decanoic acid n-Decylic acid Hexacid 1095 Neo-fat 10	Crystalline solid White Rancid odor
<p>Keep people away. Avoid contact with compound and its vapor. Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies.</p>	
<b>Fire</b>	<p>Combustible. Water may be ineffective on fire. Extinguish with dry chemical, alcohol foam, or CO<sub>2</sub>. Wear self contained breathing apparatus and protective clothing.</p>
<b>Exposure</b>	<p>CALL FOR MEDICAL AID</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID OR SOLID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.</p>
<b>Water Pollution</b>	<p>May be dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 4; Organic acids.  
2.2 Formula: CH<sub>3</sub>(CH<sub>2</sub>)<sub>8</sub>CO<sub>2</sub>H  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 334-48-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51377

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** Harmful if swallowed or inhaled. Material is irritating to tissues of mucous membranes, and upper respiratory tract, eyes and skin.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with copious amounts of water for at least 15 minutes, while removing contaminated clothing and shoes. Assure adequate flushing of the eyes by separating the eyelids with the fingers.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 129 mg/kg mouse, intravenous
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** >230°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam, water spray.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may not be effective.
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 66.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 20.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Corrosive solution, attacks most common metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Cautics:** Sodium bicarbonate solution
- 5.5 **Polymerization:** Will not occur
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 0  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99 + %
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 172.27
- 9.3 **Boiling Point at 1 atm:** 514.4-518°F = 268-270°C = 541.2-543.2°K
- 9.4 **Freezing Point:** 87.8-89.6°F = 31-32°C = 304.2-305.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.893
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 5.94
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# DECANOIC ACID

DCO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	257 288 306 320 329 356 374 392 423 465 515	0.019 0.097 0.193 0.290 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.320 0.333 0.346 0.359 0.372 0.384 0.396 0.408 0.420 0.431 0.443 0.454 0.464 0.475 0.485 0.496 0.506 0.515 0.525 0.534 0.544 0.553 0.561 0.570 0.579

# 2,4-DICHLOROPHENOL

DCP

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid crystals      Colorless      Medicinal odor

Sinks in water.

Keep people away. Avoid contact with solid and dust.  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  
Call fire department.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Combustible.  
POISONOUS GASES ARE PRODUCED IN FIRE.  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  
Extinguish with dry chemical, foam, or carbon dioxide.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.

SOLID OR DUST  
Will burn skin and eyes.  
Poisonous if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump  
Do not burn

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: HOc1ccc(Cl)cc1, 4  
2.3 IMO/UN Designation: 6.1/2020  
2.4 DOT ID No.: 2020  
2.5 CAS Registry No.: 120-83-2  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51244

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Bureau of Mines approved respirator, rubber gloves, chemical goggles.  
3.2 Symptoms Following Exposure: Tremors, convulsions, shortness of breath, inhibition of respiratory system.  
3.3 Treatment of Exposure: Inhalation-rest; Ingestion-drink water, epsom salt solution.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: 200°F O.C. 237°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Water, foam, carbon dioxide, dry chemical  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Toxic gases can be evolved.  
4.6 Behavior in Fire: Solid melts and burns.  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 28.6 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 9.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: May react vigorously with oxidizing materials  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 5 ppm/3 hours/rainbow trout/killed/fresh-water  
5 ppm/12 hours/bluegills/killed/fresh-water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 100%, 5 days  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: A  
7.6 Ship Type: 2  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	-
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: U081  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 163.01  
9.3 Boiling Point at 1 atm: 421°F = 216°C = 489°K  
9.4 Freezing Point: 110°F = 45°C = 318°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.40 at 15°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES



# 2,4-DICHLOROPHENOL

DCP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.460		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# N,N-DIMETHYLCARBAMOYL CHLORIDE

DCR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chloroformic acid dimethylamide Dimethyl carbamic chloride Dimethylcarbamylchloride N,N-Dimethylchloroformamide DMCC	Liquid  Sinks and mixes with water.
<b>Keep people away. Avoid contact with liquid and vapor. Wear self-contained positive pressure breathing apparatus and full protective clothing. Call fire department. Use water spray to "knock down" vapor. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN A FIRE. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish with dry chemical, CO <sub>2</sub> , foam, or water spray.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR Harmful if inhaled or absorbed through the skin. Extremely irritating to the eyes, nose, and throat. Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Liquid is corrosive to skin and eyes, and harmful if ingested or absorbed through the skin. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open, flush with plenty of water for at least 15 min. IF SWALLOWED: call a physician immediately.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>NCOCl
- 2.3 IMO/UN Designation: 8/2262
- 2.4 DOT ID No.: 2262
- 2.5 CAS Registry No.: 79-44-7
- 2.6 NAERG Guide No.: 156
- 2.7 Standard Industrial Trade Classification: 51471

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, chemical-resistant gloves, full protective clothing, safety goggles or 8-inch minimum face shield.
- 3.2 **Symptoms Following Exposure:** Material is extremely destructive to the mucous membranes, upper respiratory tract, eyes, and skin. Symptoms of exposure include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.
- 3.3 **Treatment of Exposure:** EYES: Hold eyelids open, flush with running water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes. flush affected areas with running water for at least 15 minutes. Discard contaminated shoes, wash clothing before reuse. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Call a physician.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 1 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Suspected Carcinogen
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 155°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, CO<sub>2</sub>, foam, and water spray.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic fumes of NO<sub>x</sub> and HCl
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 22.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Decomposes
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	-
Flammability (Red).....	1
Instability (Yellow).....	-
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** U097
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 107.54
- 9.3 **Boiling Point at 1 atm:** 333°F = 167°C = 440°K
- 9.4 **Freezing Point:** -27°F = -33°C = 240°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.168 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 3.71
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N,N-DIMETHYLCARBAMOYL CHLORIDE

DCR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.215 0.222 0.229 0.235 0.242 0.249 0.255 0.262 0.269 0.275 0.282 0.288 0.295 0.302 0.308 0.315 0.322 0.328 0.335 0.342 0.348 0.355 0.362 0.368 0.375

# DODECYLBENZENESULFONIC ACID, CALCIUM SALT

DCS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Calcium alkylaromatic sulfonate Calcium alkylbenzenesulfonate		Liquid	Yellowish-brown	Solvent odor
May float or sink in water.				
Keep people away. Avoid contact with liquid. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. DO NOT INDUCE VOMITING.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump  
Chemical and Physical Treatment:  
Absorb  
Do not burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $(C_{12}H_{25}C_6H_4SO_3)_2Ca$ -solvent  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 27176-87-0  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation. Has a drying effect on skin; prolonged contact may cause irritation.  
3.3 **Treatment of Exposure:** INGESTION: give large amount of water; do NOT induce vomiting. EYES: flush with water for at least 15 min. SKIN: wipe off, flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** <100°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** About 4 mm/min  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Solid  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 59-67%; remainder is a hydrocarbon solvent that is combustible or flammable.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.04 at 25°C (liquid solution) 0.9 at 25°C (solvent)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DODECYLBENZENESULFONIC ACID, CALCIUM SALT

DCS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	64.919		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 1,1-DICHLORO-1-NITROETHANE

DCT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Liquid	Colorless	Unpleasant odor that causes tears
<b>Keep people away.</b> <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear rubber over clothing (including gloves), goggles, and self-contained breathing apparatus. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	COMBUSTIBLE. Wear full protective clothing and self-contained breathing apparatus. Extinguish with dry chemical, CO <sub>2</sub> , or alcohol foam.		
<b>Exposure</b>	CALL FOR MEDICAL AID. Move victim to fresh air. Remove contaminated clothing and shoes. Wash affected areas with plenty of soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water, then induce vomiting. If breathing has stopped, perform artificial respiration.		
<b>Water Pollution</b>	Effects of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 42;  
Nitrocompounds  
2.2 **Formula:** CH<sub>2</sub>CCl<sub>2</sub>NO<sub>2</sub>  
2.3 **IMO/UN Designation:** Not listed.  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51138

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Impervious clothing, gloves, and face shields. In enclosed areas where concentrations could exceed 10 ppm, use self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** High concentrations cause lacrimation, increased nasal secretions, coughing, pulmonary rales, and weakness in animals. No human experience is reported.
- 3.3 **Treatment of Exposure:** Call for medical aid. EYES: Flush immediately with copious amounts of water, lifting the lids occasionally. SKIN: Wash the contaminated area with soap and water. Remove contaminated clothing. INGESTION: If victim is conscious, give large quantities of water immediately. After swallowing the water, induce vomiting. If not conscious, do nothing except keep victim warm and quiet.
- 3.4 **TLV-TWA:** 2 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Exposure of animals produced severe irritation of lungs with severe breathing difficulties, which may be delayed in onset. Liver, heart, kidney, and blood vessel damage were also reported in animals.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 25 ppm  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 10 ppm  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 136°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Toxic gases and vapors, such as nitrogen oxides, hydrogen chloride, and carbon monoxide, may be released in a fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 11.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Contact with strong oxidizers may cause fires and explosions.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Not pertinent.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 144  
9.3 **Boiling Point at 1 atm:** 257°F = 125°C = 398°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.42  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 5.0  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1,1-DICHLORO-1-NITROETHANE

DCT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.250	68	0.290	68	0.00737		C U R R E N T L Y  N O T  A V A I L A B L E

# DICHLORVOS

DCV

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> DDVP Dichlorophos 2,2-Dichlorovinyl O,O-dimethyl phosphate Nerkol Vapona	Liquid  Colorless to amber  Aromatic characteristic  Sinks and mixes with water.
<b>Evacuate.</b> Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED OR SKIN IS EXPOSED. Move to fresh air. If breathing has stopped, give artificial respiration.  LIQUID POISONOUS IF SWALLOWED OR SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** (CH<sub>3</sub>O)<sub>2</sub>P(O)OCH<sub>2</sub>CCl<sub>2</sub>  
2.3 **IMO/UN Designation:** 6.1/1615 (>2.5%); 9/1615 (>2.5%)  
2.4 **DOT ID No.:** 2783  
2.5 **CAS Registry No.:** 62-73-7  
2.6 **NAERG Guide No.:** 152  
2.7 **Standard Industrial Trade Classification:** 51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear safety glasses, gas mask, gloves, and top boots, overalls with long sleeves and closed collar.
- 3.2 **Symptoms Following Exposure:** First symptoms are headache, fatigue, dizziness, blurred vision, excessive sweating, nausea and vomiting, stomach cramps, diarrhea, and salivation. As poisoning progresses muscular twitching beginning with eyelids and tongue then face and neck, and finally, generalized twitching with profound muscular weakness. Constriction of pupils may be from systemic poisoning or local effect of spray in eye. A contact dermatitis may develop. Symptoms may be experienced during exposure or up to 8 hours later.
- 3.3 **Treatment of Exposure:** Call a physician. **INHALATION:** In the nonbreathing victim immediately institute artificial respiration. Treat in a cool place. **EYES:** Rinse with abundant water. **SKIN:** Flood and wash thoroughly with water. Remove contaminated clothing under a shower. **INGESTION:** Administer milk, water, or salt water and induce vomiting repeatedly. **OTHER:** As soon as local or systemic signs of intoxication are noted 2 mg (1/30 gr) of atropine should be administered intramuscularly or IV. Repeat every 3 to 8 minutes until signs of atropinization (mydriasis, dry mouth, rapid pulse hot and dry skin) occurs. For children use 1 mg of atropine. Keep airway clear.
- 3.4 **TLV-TWA:** 0.1 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Teratogenic effects. Workers exposed to low levels of pesticide suffered a decrease in serum and red cell cholinesterase. These workers had more health complaints (frequent headaches, dizziness, sore throat, nausea, etc.) than nonexposed workers.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 100 mg/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 1 mg/m<sup>3</sup>  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed.

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Practically not flammable  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Stable to heat  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Corrosive to iron and mild steel.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 0.7 ppm/48-hour/Bluegill/LC<sub>50</sub>  
0.025 to 3.2 ppm/48-hour/6 fresh water Crustacea/TL<sub>m</sub>  
6.2 **Waterfowl Toxicity:** Young mallard LD<sub>50</sub> = 7.8 mg/kg  
6.3 **Biological Oxygen Demand (BOD):** Persists 62 days in water 20°C  
6.4 **Food Chain Concentration Potential:** Prolonged exposure to organo-phosphorus pesticides at concentrations as low as 0.01 ppb are toxic to marine animals due to bioconcentration.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: ii  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 220.98  
9.3 **Boiling Point at 1 atm:** 284°F = 140°C = 413.2°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.415 at 25°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# DICHLORVOS

DCV

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E	105 110 115 120 125 130 135 140	0.001 0.001 0.001 0.001 0.002 0.002 0.003 0.003	90 95 100 105 110 115 120 125 130 135 140	0.00001 0.00001 0.00001 0.00002 0.00003 0.00003 0.00004 0.00005 0.00007 0.00009 0.00012		C U R R E N T L Y  N O T  A V A I L A B L E

# 4,6-DINITRO-O-CYCLOHEXYL PHENOL

DCY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Cyclohexyl-4,6-dinitrophenol 2,4-Dinitro-6-cyclohexylphenol Dinitro-o-cyclohexylphenol		Solid crystal	Yellow
Keep people away. AVOID CONTACT WITH SOLID AND DUST. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Evacuate area in case of large discharges. Call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible May explode if subjected to heat or flame. POISONOUS GAS IS PRODUCED WHEN HEATED. Evacuate surrounding area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from safe distance or protected location.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Dredge Do not burn Clean shore line Salvage waterfowl	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>12</sub> H <sub>14</sub> N <sub>2</sub> O <sub>5</sub> 2.3 IMO/UN Designation: NA9026 2.4 DOT ID No.: Not listed. 2.5 CAS Registry No.: 131-89-5 2.6 NAERG Guide No.: 153 2.7 Standard Industrial Trade Classification: 51243
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus; butyl rubber gloves; goggles; lab coat; protective shoes. 3.2 <b>Symptoms Following Exposure:</b> Liver damage, metabolic stimulant, dermatitis, dilation of pupils. 3.3 <b>Treatment of Exposure:</b> Remove victim from contaminated area and wash exposed skin with soap and water. Administer oxygen if respiratory problems develop. Refer to a doctor. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 4; LD <sub>50</sub> = 50 mg/kg (mouse) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Not pertinent 3.11 <b>Liquid or Solid Characteristics:</b> Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide, foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Can detonate or explode when heated under confinement.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 71.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 21.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Reacts with oxidizing materials and combustibles.  
5.3 **Stability During Transport:** May detonate when heated under confinement.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 266.25  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** 225°F = 107°C = 380°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 9.2  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# 4,6-DINITRO-O-CYCLOHEXYL PHENOL

DCY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.099 0.105 0.110 0.116 0.122 0.127 0.133 0.139 0.144 0.150 0.155 0.161 0.167 0.172 0.178 0.184 0.189 0.195 0.201 0.206 0.212 0.218 0.223 0.229 0.235

# DODECYLBENZENE

DDB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Detergent alkylate n-Dodecylbenzene Laurylbenzene 1-Phenyldecane Ucane alkylate 12	Liquid  Colorless  Weak oily odor  Floats on water.
<b>Keep people away. Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Chemical and Physical Treatment: Absorb Clean shore line Salvage waterfowl	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 32; Aromatic Hydrocarbon <b>2.2 Formula:</b> C <sub>12</sub> H <sub>26</sub> (CH <sub>2</sub> ) <sub>11</sub> CH <sub>3</sub> <b>2.3 IMO/UN Designation:</b> Not listed <b>2.4 DOT ID No.:</b> Not listed <b>2.5 CAS Registry No.:</b> Currently not available <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 51129
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Goggles or face shield; rubber gloves. <b>3.2 Symptoms Following Exposure:</b> Liquid causes mild irritation of eyes and may cause allergenic responses on repeated contact with skin. Ingestion causes nausea. <b>3.3 Treatment of Exposure:</b> EYES: flush with water for at least 15 min.; get medical attention for persistent irritation. SKIN: wash with soap and water. INGESTION: do NOT induce vomiting; get medical attention. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 1; LD <sub>50</sub> = 5 to 15 g/kg <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors are nonirritating to eyes and throat. <b>3.11 Liquid or Solid Characteristics:</b> No appreciable hazard. Practically harmless to the skin. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 275°F O.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Dry chemical, foam  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Not pertinent  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** 3.7 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 121.4 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 33.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Various mixtures containing 70-80% of undecyl-plus dodecyl-benzene, along with 10% decylbenzene and other analogous hydrocarbons.  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester)  
**7.5 IMO Pollution Category:** C  
**7.6 Ship Type:** Data not available  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed  
**8.2 49 CFR Class:** Not pertinent  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 240  
**9.3 Boiling Point at 1 atm:** 550°F = 288°C = 561°K  
**9.4 Freezing Point:** Not pertinent  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 0.860 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** 30.12 dynes/cm = 0.0301 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
**9.12 Latent Heat of Vaporization:** 150 Btu/lb = 82 cal/g = 3.4 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -18,100 Btu/lb = -10,000 cal/g = -418 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 4.1 psia

## NOTES

# DODECYLBENZENE

DDB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	54.510	52	0.450	52	1.048	35	9.773
36	54.460	54	0.450	54	1.048	40	8.976
38	54.410	56	0.450	56	1.048	45	8.258
40	54.360	58	0.450	58	1.048	50	7.611
42	54.310	60	0.450	60	1.048	55	7.025
44	54.270	62	0.450	62	1.048	60	6.494
46	54.220	64	0.450	64	1.048	65	6.012
48	54.170	66	0.450	66	1.048	70	5.574
50	54.120	68	0.450	68	1.048	75	5.176
52	54.070	70	0.450	70	1.048	80	4.812
54	54.020	72	0.450	72	1.048	85	4.480
56	53.970	74	0.450	74	1.048	90	4.176
58	53.930	76	0.450	76	1.048	95	3.898
60	53.880	78	0.450	78	1.048	100	3.643
62	53.830	80	0.450	80	1.048	105	3.409
64	53.780	82	0.450	82	1.048	110	3.193
66	53.730	84	0.450	84	1.048	115	2.994
68	53.680	86	0.450	86	1.048	120	2.811
70	53.630						
72	53.590						
74	53.540						
76	53.490						
78	53.440						
80	53.390						
82	53.340						
84	53.290						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I		N		N	0	0.313
	N		O		O	10	0.319
	S		T		T	20	0.325
	O					30	0.330
	L		P		P	40	0.336
	U		E		E	50	0.342
	B		R		R	60	0.347
	I		T		T	70	0.353
	E		I		I	80	0.358
			N		N	90	0.364
			E		E	100	0.370
			N		N	110	0.375
			T		T	120	0.381
						130	0.386
						140	0.392
						150	0.398
						160	0.403
						170	0.409
						180	0.414
						190	0.420
						200	0.426
						210	0.431
						220	0.437
						230	0.442
						240	0.448
						250	0.454

# 1-DODECENE

DDC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Adacene-12 alpha-Dodecylene	Watery liquid  Colorless  Mild, pleasant odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_{10}\text{CH}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 6842-15-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield  
3.2 **Symptoms Following Exposure:** No inhalation hazard expected. Aspiration hazard if ingested. Minor skin and eye irritation.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. INGESTION: do NOT induce vomiting! Do NOT lavage! Give vegetable oil and demulcents; call physician. EYE CONTACT: flush with water for 15 min. SKIN CONTACT: wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Slight smarting of eyes and respiratory system at high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 212°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 491°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 5.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 85.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 24.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 93-98% normal alpha olefins  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 168.31  
9.3 **Boiling Point at 1 atm:** 415°F = 213°C = 486°K  
9.4 **Freezing Point:** -31°F = -35°C = 238°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.758 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 25.6 dynes/cm = 0.0256 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.032  
9.12 **Latent Heat of Vaporization:** 110 Btu/lb = 61.0 cal/g =  $2.55 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -18,911 Btu/lb = -10,506 cal/g =  $-439.87 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.01 psia

### NOTES

# 1-DODECENE

DDC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	48.050	85	0.465	30	0.973	40	1.699
50	47.800	90	0.476	40	0.965	50	1.541
60	47.540	95	0.486	50	0.957	60	1.404
70	47.290	100	0.497	60	0.949	70	1.283
80	47.040	105	0.507	70	0.941	80	1.177
90	46.780	110	0.517	80	0.933	90	1.083
100	46.530	115	0.528	90	0.924	100	0.999
110	46.280	120	0.538	100	0.916	110	0.924
120	46.020	125	0.549	110	0.908	120	0.858
130	45.770	130	0.559	120	0.900	130	0.798
140	45.520	135	0.570	130	0.892	140	0.744
150	45.270	140	0.580	140	0.884	150	0.695
160	45.010	145	0.590	150	0.875	160	0.651
170	44.760	150	0.601	160	0.867	170	0.611
180	44.510			170	0.859	180	0.575
190	44.250			180	0.851	190	0.542
200	44.000			190	0.843	200	0.511
210	43.750			200	0.835	210	0.483

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.003	70	0.00010	0	0.337
	N	80	0.005	80	0.00014	25	0.352
	S	90	0.007	90	0.00021	50	0.367
	O	100	0.011	100	0.00029	75	0.381
	L	110	0.015	110	0.00042	100	0.396
	U	120	0.021	120	0.00058	125	0.410
	B	130	0.030	130	0.00080	150	0.424
	L	140	0.042	140	0.00109	175	0.438
	E	150	0.057	150	0.00146	200	0.452
		160	0.077	160	0.00196	225	0.465
		170	0.104	170	0.00259	250	0.479
		180	0.138	180	0.00339	275	0.492
		190	0.183	190	0.00441	300	0.505
		200	0.239	200	0.00568	325	0.517
		210	0.310	210	0.00726	350	0.530
		220	0.400	220	0.00922	375	0.542
		230	0.511	230	0.01162	400	0.555
		240	0.649	240	0.01455	425	0.567
		250	0.819	250	0.01809	450	0.579
		260	1.026	260	0.02236	475	0.590
		270	1.279	270	0.02747	500	0.602
		280	1.583	280	0.03356	525	0.613
		290	1.949	290	0.04077	550	0.624
		300	2.387	300	0.04926	575	0.635
						600	0.646

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,1-Dichloro-2,2-bis(p-chlorophenyl) ethane Dichlorodiphenyldichloroethane TDE	Solid  White   Sinks in water.
<b>Keep people away.</b> <b>Avoid contact with solid and dust.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Irritating gases may be produced when heated. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $(4\text{-ClC}_6\text{H}_4)_2\text{CH-CHCl}_2$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2761
- 2.5 CAS Registry No.: 72-54-8
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 59110

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; rubber gloves
- 3.2 **Symptoms Following Exposure:** Ingestion causes vomiting and delayed symptoms similar to those caused by DDT. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** INGESTION: treatment should be given by a physician and is similar to that given following ingestion of DDT. EYES: flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 1.2 \text{ g/kg}$  (mouse), 3.4 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
<2.6 ppm/96 hr/catfish/TL<sub>m</sub>/fresh water  
0.15-0.2 ppm/48 hr/brown shrimp/TL<sub>m</sub>/salt water  
0.0068 ppm/24 hr/brown shrimp/LC<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** 4,800-5,200 ppm LC<sub>50</sub>
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
High
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** U060
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 320
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 234°F = 112°C = 385°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.476 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# DDD

DDD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 2,2-DIMETHYLPROPANE-1,3-DIOL

DDI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dimethylol propane Dimethyltrimethylene glycol Neol Neopentylene glycol Neopentyl glycol 1,3-Propanediol, 2,2-dimethyl		Crystalline solid      White
Call fire department. Notify local health and pollution control agencies.		
<b>Fire</b>	Combustible. Water may be ineffective on fire. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Wear self-contained breathing apparatus and protective clothing.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin or eyes. Harmful if swallowed. Flush affected areas with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 20; Alcohols, glycols  
2.2 **Formula:** HOCH<sub>2</sub>C(CH<sub>3</sub>)<sub>2</sub>CH<sub>2</sub>OH  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 126-30-7  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51229

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots, and heavy rubber gloves.  
3.2 **Symptoms Following Exposure:** May be harmful by ingestion or skin absorption. Causes eye and skin irritation. Material is irritating to mucous membrane and upper respiratory tract. **INHALATION:** Call for medical aid. Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  
3.3 **Treatment of Exposure:** EYES: Flush with copious amounts of water. SKIN: Wash with soap and copious amounts of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 6.4 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 225°F C.C.  
4.2 **Flammable Limits in Air:** LEL 1.37% @ 149°C; UEL 18.8 @ 177°C  
4.3 **Fire Extinguishing Agents:** Water sprays, dry chemical powder, alcohol or polymer foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Emits toxic fumes under fire condition.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 730°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Currently not available  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 104.15  
9.3 **Boiling Point at 1 atm:** 406.4°F = 208°C = 481.2°K  
9.4 **Freezing Point:** 253.4-260.6°F = 123-127°C = 396.2-400.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.6  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2,2-DIMETHYLPROPANE-1,3-DIOL

DDI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	68	0.015		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.357 0.369 0.381 0.393 0.404 0.416 0.427 0.438 0.448 0.459 0.469 0.479 0.489 0.499 0.508 0.518 0.527 0.536 0.544 0.553 0.561 0.569 0.577 0.585 0.593

# DODECYLMETHACRYLATE

DDM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dodecyl-2-methyl-2-propenoate Lauryl methacrylate Methacrylic acid, dodecyl ester		Liquid  Floats on water.
Keep people away. Avoid contact with liquid and vapor. Wear self-contained positive pressure breathing apparatus and full protective clothing. Call fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. Wear self-contained positive pressure breathing apparatus and full protective clothing. Poisonous gases may be produced in fire. Containers may explode in fire. Extinguish with foam, CO <sub>2</sub> or dry chemicals. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove and isolate contaminated clothing and shoes at the site. IF IN EYES OR ON SKIN, flush with running water for at least 15 min; hold eyelids open if necessary. Wash skin with soap and water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Clean shore line	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 14; Acrylates 2.2 Formula: CH <sub>2</sub> = C(CH <sub>3</sub> )CO <sub>2</sub> (CH <sub>2</sub> ) <sub>11</sub> CH <sub>3</sub> 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 142-90-5 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51373
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Inhalation temporarily reduces blood pressure from 5 to 25%, increases respiratory rate, decreases heart rate, and causes some EKG changes. Liquid may cause irritation of eyes and skin. May be harmful if swallowed. 3.3 <b>Treatment of Exposure:</b> INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min; hold eyelids open if necessary. Wash skin with soap and water. INGESTION: If victim is conscious, have victim drink milk or water and induce vomiting. If victim is unconscious or having convulsions, do nothing except keep victim warm. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 0; LD <sub>50</sub> > 87.25 g/Kg (mouse) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** >230°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, CO<sub>2</sub> or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Not pertinent.  
4.6 **Behavior in Fire:** Heat can induce polymerization with rapid release of energy. Sealed containers may rupture explosively.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 109.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 31.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Oxidizing and reducing agents may initiate polymerization.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Reaction may occur when heated.  
5.6 **Inhibitor of Polymerization:** 90-120 ppm hydroquinone

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** III  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not Listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 254.42  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** -8°F = -22.2°C = 251°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.868 at 25°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 8.8 (est.)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# DODECYLMETHACRYLATE

DDM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DODECANOL

DDN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dodecyl alcohol Lauryl alcohol	Thick liquid  Colorless  Sweet odor
Floats on water. Freezing point is 75°F.	
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin. Will burn eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohols, glycols  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_{10}\text{CH}_2\text{OH}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 112-53-8  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51229

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Chemical gloves; chemical goggles  
3.2 Symptoms Following Exposure: Liquid will cause burning of the eyes and may irritate skin.  
3.3 Treatment of Exposure: SKIN OR EYES: wash exposed areas with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 1;  $\text{LD}_{50} = 5.5$  to 15 g/kg (humans)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: None  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 260°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Alcohol foam, carbon dioxide, dry chemical  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 527°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 85.7 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 25.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 30% (theor.), 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 98.5-99.5%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: B  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 186.33  
9.3 Boiling Point at 1 atm: 498°F = 259°C = 532K  
9.4 Freezing Point: 75°F = 24°C = 297°K  
9.5 Critical Temperature: 762.8°F = 406°C = 679.2°K  
9.6 Critical Pressure: 280 psia = 19 atm = 1.9 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.831 at 24°C (liquid)  
9.8 Liquid Surface Tension: 27.4 dynes/cm = 0.0274 N/m at 25°C  
9.9 Liquid Water Interfacial Tension: (est.) 30 dynes/cm = 0.03 N/m at 30°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.030  
9.12 Latent Heat of Vaporization: (est.) 110 Btu/lb = 62 cal/g = 2.6 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: (est.) -18,000 Btu/lb = -10,000 cal/g = -420 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

NOTES

# DODECANOL

DDN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
80	51.740	85	0.606	90	1.005	86	1.545
85	51.610	90	0.612	95	1.003	88	1.506
90	51.470	95	0.618	100	1.000	90	1.469
95	51.340	100	0.625	105	0.997	92	1.433
100	51.200	105	0.631	110	0.994	94	1.398
105	51.070	110	0.637	115	0.991	96	1.364
110	50.930	115	0.643	120	0.989	98	1.331
115	50.800	120	0.649	125	0.986	100	1.299
120	50.660	125	0.655	130	0.983	102	1.268
125	50.520	130	0.661	135	0.980	104	1.238
130	50.390	135	0.667	140	0.978	106	1.209
135	50.250	140	0.673	145	0.975	108	1.181
140	50.120	145	0.680	150	0.972	110	1.154
145	49.980	150	0.686	155	0.969	112	1.128
150	49.850			160	0.967	114	1.102
155	49.710			165	0.964	116	1.077
160	49.580			170	0.961	118	1.053
165	49.440			175	0.958	120	1.029
170	49.310			180	0.955		
175	49.170			185	0.953		
180	49.040			190	0.950		
185	48.900			195	0.947		
190	48.770			200	0.944		
195	48.630			205	0.942		
200	48.500						
205	48.360						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I		N		N	0	0.333
	N		O		O	25	0.347
	S		T		T	50	0.361
	O					75	0.375
	L		P		P	100	0.389
	U		E		E	125	0.403
	B		R		R	150	0.416
	I		T		T	175	0.430
	E		I		I	200	0.443
			N		N	225	0.456
			E		E	250	0.469
			N		N	275	0.482
			T		T	300	0.495
						325	0.507
						350	0.519
						375	0.532
						400	0.544
						425	0.556
						450	0.567
						475	0.579
						500	0.590
						525	0.601
						550	0.613
						575	0.624
						600	0.634

# DODECYL/PENTADECYL METHACRYLATE

DDP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methacrylic acid, dodecyl and pentadecyl ester mix Methacrylic acid, lauryl and pentadecyl ester mix	Liquid	Colorless
Floats on water.		
<b>Keep people away. Avoid contact with liquid and vapor.</b> <b>Wear self-contained, positive pressure breathing apparatus and full protective clothing.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>		
<b>Fire</b>	Combustible. Poisonous gases may be produced in fire. Container may explode in heat of fire. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish with foam, CO <sub>2</sub> , or dry chemicals. Cool containers that are exposed to flames with water from the side until well after fire is out.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Vapors may cause dizziness or suffocation. Remove and isolate contaminated clothing and shoes at the site. IF IN EYES OR ON SKIN: flush with running water for at least 15 minutes, hold eyelids open if necessary. Wash skin with soap and water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Clean shore line	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 14; Acrylates <b>2.2 Formula:</b> [CH <sub>2</sub> =C(CH <sub>3</sub> )COO]C <sub>12</sub> H <sub>25</sub> and [CH <sub>2</sub> =C(CH <sub>3</sub> )COO]C <sub>15</sub> H <sub>31</sub> <b>2.3 IMO/UN Designation:</b> Not listed <b>2.4 DOT ID No.:</b> Not listed <b>2.5 CAS Registry No.:</b> Not applicable <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 51373
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. <b>3.2 Symptoms Following Exposure:</b> Inhalation temporarily reduces blood pressure from 5 to 25%, increases respiratory rate, decreases heart rate, and causes some EKG changes. Liquid may cause irritation of eyes and skin. May be harmful if swallowed. <b>3.3 Treatment of Exposure:</b> INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 minutes; hold eyelids open if necessary. Wash skin with soap and water. INGESTION: If victim is conscious, have victim drink water or milk and induce vomiting. If victim is unconscious or having convulsions, do nothing except keep victim warm. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Currently not available <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Currently not available <b>3.11 Liquid or Solid Characteristics:</b> Currently not available <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** Currently not available  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Foam, CO<sub>2</sub>, or dry chemical  
**4.4 Fire Extinguishing Agents Not to Be Used:** Currently not available  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Heat can induce polymerization with rapid release of energy. Sealed containers may rupture explosively.  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** Oxidizing and reducing agents may initiate polymerization.  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Reaction may occur when heated.  
**5.6 Inhibitor of Polymerization:** 90 - 120 ppm hydroquinone

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Currently not available  
**7.2 Storage Temperature:** Currently not available  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed  
**8.2 49 CFR Class:** Not pertinent  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** 5000 pounds  
**8.7 EPA Pollution Category:** D  
**8.8 RCRA Waste Number:** U107  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** liquid  
**9.2 Molecular Weight:** Not Pertinent (mixture)  
**9.3 Boiling Point at 1 atm:** Currently not available  
**9.4 Freezing Point:** Currently not available  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 0.87 at 25°C (approx)  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** Currently not available  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES



# DODECYL/PENTADECYL METHACRYLATE

DDP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DODECYL SULFATE, SODIUM SALT

DDS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lauryl sodium sulfate Lauryl sulfate, sodium salt Sodium dodecyl sulfate Sodium lauryl sulfate	Solid paste or liquid    White to pale yellow    Mild odor  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID OR LIQUID Will burn eyes. Irritating to eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{12}H_{25}OSO_3Na$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 151-21-3  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; dust mask or face shield  
3.2 **Symptoms Following Exposure:** Inhalation of dust causes sneezing and coughing. Ingestion of large amounts causes irritation of stomach. Dust irritates eyes and may cause burns on prolonged contact. Contact with skin causes some irritation; continued exposure to water solution causes drying out and cracking.  
3.3 **Treatment of Exposure:** INHALATION: remove from exposure. INGESTION: consult a doctor if large amounts have been ingested. EYES: flush well with water; consult doctor if irritation persists. SKIN: flush with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $LD_{50} = 1 \text{ g/kg (rat)}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 5.8 ppm/24 hr/plaice/LC<sub>50</sub>  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 99% of theoretical in 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 89-96%; pharmaceutical grade; also shipped as 28-50% solutions in water.  
7.2 **Storage Temperature:** Below 38°C (100°F)  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 288  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** >1.1 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

DODECYL SULFATE, SODIUM SALT

DDS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT PERTINENT		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	VERY SOLUBLE		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

## DDT

DDT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> p,p'-DDT Dichlorodiphenyltrichloroethane 1,1,1-Trichloro-2,2-bis(p-chlorophenyl) ethane	Solid	Colorless	Odorless
Sinks in water.			
Avoid contact with solid. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam, or carbon dioxide.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLIDS Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, headache, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge  
Chemical and Physical Treatment:  
Absorb  
Clean shore line

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (p-ClC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>CHCCl<sub>3</sub>  
2.3 IMO/UN Designation: 9/2761  
2.4 DOT ID No.: 2761  
2.5 CAS Registry No.: 50-29-3  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 59110

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Currently not available
- 3.2 **Symptoms Following Exposure:** Very large doses are followed promptly by vomiting, due to local gastric irritation; delayed emesis or diarrhea may occur. With smaller doses, symptoms usually appear 2-3 hours after ingestion. These include tingling of lips, tongue, and face; malaise, headache, sore throat, fatigue, coarse tremors of neck, head, and eyelids; apprehension, ataxia, and confusion. Convulsions may alternate with periods of coma and partial paralysis. Vital signs are essentially normal, but in severe poisoning the pulse may be irregular and abnormally slow; ventricular fibrillation and sudden death may occur at any time during acute phase. Pulmonary edema usually indicates solvent intoxication.
- 3.3 **Treatment of Exposure:** INGESTION: treatment should be done by a physician. It usually includes gastric lavage and administration of saline cathartic, phenobarbital, and parenteral fluids. Patient should be kept quiet and under observation for at least 24 hours.
- 3.4 **TLV-TWA:** 1 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 500 mg/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 1 mg/m<sup>3</sup>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 162°F-171°F C.C.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating gases may be generated
- 4.6 **Behavior in Fire:** Melts and burns
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 71.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 21.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.0039 ppm/24 hr/bass/TL<sub>50</sub>/fresh water  
0.0018 ppm/96 hr/bass/TL<sub>50</sub>/fresh water  
0.0028 ppm/48 hr/killfish/50% kill/salt water
- 6.2 **Waterfowl Toxicity:** 2240 mg/kg
- 6.3 **Biological Oxygen Demand (BOD):** Not pertinent
- 6.4 **Food Chain Concentration Potential:** High
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** U061
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 354.5
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** 226°F = 108°C = 381°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.56 at 15°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

## DDT

DDT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DIMETHYLHEXANE DIHYDROPEROXIDE

DDW

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,5-Dihydroperoxy-2,5-dimethylhexane 2,5-Dimethylhexane-2,5-dihydroperoxide		Wet solid                      White
		May float or sink in water.
Keep people away. Shut off ignition sources and call fire department. Avoid contact with solid. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable when wet. Will increase the intensity of a fire. May explode if exposed to heat or flames. Flood discharge area with water to prevent fire. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_8H_{18}(OOH)_2 \cdot H_2O$
- 2.3 IMO/UN Designation: 5.2/2174
- 2.4 DOT ID No.: Currently not available
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 146
- 2.7 Standard Industrial Trade Classification: 51699

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Contact with eyes or skin causes irritation.
- 3.3 Treatment of Exposure: INHALATION: remove from exposure; call a doctor. EYES: wash with large amount of water for at least 15 min. SKIN: wash with large amount of water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent
- 4.2 Flammable Limits in Air: Not pertinent
- 4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective on fire.
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Decomposes violently when heated in fire. Can increase intensity of fire when in contact with combustible material. Containers may explode.
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Decomposes in contact with many metals and acids.
- 5.3 Stability During Transport: Stable below 100°F
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Approx. 30+% water. The dry chemical is too hazardous to ship.
- 7.2 Storage Temperature: 4-38°C (40-100°F)
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.
- 8.2 49 CFR Class: Not pertinent.
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 178.2
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: (est.) 1.0 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# DIMETHYLHEXANE DIHYDROPEROXIDE

DDW

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DIETHANOLAMINE

DEA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> DEA 2,2'-Dihydroxydiethyl amine Di(2-hydroxyethyl) amine Bis-(2-Hydroxyethyl)amine 2,2'-Iminodiethanol	Oily liquid or solid crystals  Liquid is colorless; Solid is white  Slight dead fish or ammonia odor  Sinks and mixes with water.
<b>Keep people away. Avoid contact with liquid. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 8; Alkanolamine
- 2.2 Formula: (HOCH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>NH
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 111-42-2
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51461

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full face mask or amine vapor mask only, if required; clean body-covering clothing, chemical goggles.
- 3.2 **Symptoms Following Exposure:** Irritation of eyes and skin. Breathing vapors may cause coughing, a smothering sensation, nausea, headache.
- 3.3 **Treatment of Exposure:** INHALATION: no problem likely. Get medical attention if ill effects develop. INGESTION: induce vomiting if large amounts are swallowed and call a physician. Treat symptomatically. No known antidote. EYES: flush with plenty of water for at least 15 min. and get medical attention promptly. SKIN: flush with plenty of water. Wash contaminated clothing before reuse.
- 3.4 TLV-TWA: 0.46 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 305°F O.C.
- 4.2 **Flammable Limits in Air:** 1.6% (calc.)-9.8% (est.)
- 4.3 **Fire Extinguishing Agents:** Water, alcohol foam, carbon dioxide, dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Addition of water may cause frothing.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 1224°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 0.74 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 32.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 2100 ppm/24 hr/sunfish, bluegill/TL<sub>m</sub>/ fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 10% (theor.), 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 85-99.5%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 105.14
- 9.3 **Boiling Point at 1 atm:** 515.1°F = 268.4°C = 541.6°K
- 9.4 **Freezing Point:** 82°F = 28°C = 301°K
- 9.5 **Critical Temperature:** 827.6°F = 442°C = 715.2°K
- 9.6 **Critical Pressure:** 470 psia = 32 atm = 3.2 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.095 at 28°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.053
- 9.12 **Latent Heat of Vaporization:** 266 Btu/lb = 148 cal/g = 6.20 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -10,790 Btu/lb = -6000 cal/g = .251 X 10<sup>6</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) -13 Btu/lb = -7 cal/g = -0.3 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.97 psia

### NOTES



# DIETHANOLAMINE

DEA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
85	68.230	85	0.584		N		N
90	68.110	90	0.589		O		O
95	67.990	95	0.594		T		T
100	67.870	100	0.599				
105	67.750	105	0.604		P		P
110	67.639	110	0.609		E		E
115	67.520	115	0.614		R		R
120	67.400	120	0.619		T		T
125	67.280	125	0.624		I		I
130	67.169	130	0.629		N		N
135	67.049	135	0.634		E		E
140	66.929	140	0.639		N		N
145	66.809	145	0.644		T		T
150	66.690	150	0.649				
155	66.580						
160	66.459						
165	66.339						
170	66.219						
175	66.099						
180	65.990						
185	65.870						
190	65.750						
195	65.629						
200	65.509						
205	65.400						
210	65.280						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	310	0.221	310	0.00281	0	0.345
	I	320	0.289	320	0.00363	25	0.355
	S	330	0.376	330	0.00466	50	0.364
	C	340	0.485	340	0.00594	75	0.373
	I	350	0.619	350	0.00749	100	0.382
	B	360	0.786	360	0.00939	125	0.391
	L	370	0.990	370	0.01169	150	0.400
	E	380	1.238	380	0.01444	175	0.408
		390	1.538	390	0.01773	200	0.416
		400	1.899	400	0.02164	225	0.424
		410	2.330	410	0.02624	250	0.431
		420	2.843	420	0.03165	275	0.438
		430	3.448	430	0.03796	300	0.445
		440	4.161	440	0.04530	325	0.452
		450	4.995	450	0.05378	350	0.458
		460	5.967	460	0.06354	375	0.465
		470	7.094	470	0.07474	400	0.471
		480	8.396	480	0.08751	425	0.476
		490	9.893	490	0.10200	450	0.482
		500	11.610	500	0.11850	475	0.487
		510	13.570	510	0.13700	500	0.492
		520	15.800	520	0.15790	525	0.496
		530	18.320	530	0.18130	550	0.501
		540	21.170	540	0.20740	575	0.505
		550	24.380	550	0.23650	600	0.509
		560	27.980	560	0.26880		

# DIETHYLBENZENE

DEB

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid

Colorless

Sweet, gasoline-like odor

Floats on water.

Keep people away.  
Call fire department.  
Avoid contact with liquid.  
Notify local health and pollution control agencies.

### Fire

Combustible.  
Extinguish with water, dry chemical, foam, or carbon dioxide.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.

#### LIQUID

Irritating to skin and eyes.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
Fouling to shoreline.  
May be dangerous if its enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 32; Aromatic  
Hydrocarbon  
2.2 Formula:  $C_8H_{10}(C_2H_5)_2$   
2.3 IMO/UN Designation: 3.3/2049  
2.4 DOT ID No.: 2049  
2.5 CAS Registry No.: 1300-82-9  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51129

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, safety goggles  
3.2 **Symptoms Following Exposure:** High vapor concentrations produce eye and respiratory tract irritation, dizziness, depression. Liquid irritates and may blister skin, can cause corneal injury to eye.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air and start artificial respiration. INGESTION: do NOT induce vomiting; call a doctor. CONTACT WITH EYES AND SKIN: flush with water for 15 min. Wash skin with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat  $LD_{50} = 1.2$  g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 135°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, water, carbon dioxide, or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 743°F (ortho)  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 64.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 17.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):**  $N_2$  diluent: 8.5%

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical (mixture of isomers)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 134.21  
9.3 **Boiling Point at 1 atm:** 356°F = 180°C = 453°K  
9.4 **Freezing Point:** < 160°F = < 70°C = < 343°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.86 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 30 dynes/cm = 0.030 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 140 Btu/lb = 77 cal/g =  $3.2 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -17,800 Btu/lb = -9890 cal/g =  $-414 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.05 psia

## NOTES

# DIETHYLBENZENE

DEB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	55.110	51	0.459	42	1.040	50	0.878
36	55.040	52	0.459	44	1.040	52	0.862
38	54.970	53	0.459	46	1.040	54	0.846
40	54.900	54	0.459	48	1.040	56	0.831
42	54.830	55	0.459	50	1.040	58	0.817
44	54.770	56	0.459	52	1.040	60	0.802
46	54.700	57	0.459	54	1.040	62	0.788
48	54.630	58	0.459	56	1.040	64	0.775
50	54.560	59	0.459	58	1.040	66	0.762
52	54.490	60	0.459	60	1.040	68	0.749
54	54.420	61	0.459	62	1.040	70	0.736
56	54.350	62	0.459	64	1.040	72	0.724
58	54.280	63	0.459	66	1.040	74	0.712
60	54.210	64	0.459	68	1.040	76	0.700
62	54.140	65	0.459	70	1.040	78	0.689
64	54.070	66	0.459	72	1.040	80	0.677
66	54.000	67	0.459	74	1.040	82	0.666
68	53.930	68	0.459	76	1.040	84	0.656
70	53.860	69	0.459				
72	53.790	70	0.459				
74	53.730	71	0.459				
76	53.660	72	0.459				
78	53.590	73	0.459				
80	53.520	74	0.459				
82	53.450	75	0.459				
84	53.380	76	0.459				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	110	0.068	110	0.00150		N
	N	120	0.093	120	0.00200		O
	S	130	0.125	130	0.00265		T
	O	140	0.167	140	0.00348		
	L	150	0.220	150	0.00452		P
	U	160	0.288	160	0.00582		E
	B	170	0.374	170	0.00743		R
	L	180	0.482	180	0.00942		T
	E	190	0.616	190	0.01185		I
		200	0.781	200	0.01480		N
		210	0.983	210	0.01835		E
		220	1.229	220	0.02261		N
		230	1.527	230	0.02769		T
		240	1.886	240	0.03370		
		250	2.315	250	0.04079		
		260	2.826	260	0.04909		
		270	3.430	270	0.05877		
		280	4.142	280	0.07001		
		290	4.976	290	0.08299		
		300	5.950	300	0.09793		

# DIETHYL CARBONATE

DEC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carbonic acid, diethyl ester Ethyl carbonate Eufin	Watery liquid  Colorless  Pleasant odor
Floats on water. Flammable, irritating vapor is produced.	
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPORS</b> Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, nausea, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (CH<sub>3</sub>CH<sub>2</sub>)<sub>2</sub>CO<sub>3</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2366  
2.5 CAS Registry No.: 105-58-8  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective clothing; rubber gloves and goggles, organic vapor canister or air mask.
- 3.2 **Symptoms Following Exposure:** High vapor concentrations can cause headache, irritation of eyes and respiratory tract, dizziness, nausea, weakness, loss of consciousness.
- 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; administer artificial respiration and oxygen if needed. EYES: flush with water for at least 15 min.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors may cause slight smarting of eyes.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEG1:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 115°F O.C. 77°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 3.4 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Too slow to be hazardous
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99-100%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 118.13
- 9.3 **Boiling Point at 1 atm:** 260.2°F = 126.8°C = 400.0°K
- 9.4 **Freezing Point:** -45°F = -43°C = 230°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.975 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 26.3 dynes/cm = 0.0263 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** 12.86 dynes/cm = 0.01286 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.110
- 9.12 **Latent Heat of Vaporization:** 130 Btu/lb = 73 cal/g = 3.1 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -9760 Btu/lb = -5420 cal/g = -227 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIETHYL CARBONATE

DEC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	62.010	40	0.455	42	1.248	52	0.921
40	61.830	50	0.458	44	1.248	54	0.905
45	61.660	60	0.461	46	1.248	56	0.890
50	61.490	70	0.463	48	1.248	58	0.875
55	61.310	80	0.466	50	1.248	60	0.860
60	61.140	90	0.469	52	1.248	62	0.845
65	60.970	100	0.472	54	1.248	64	0.831
70	60.790	110	0.475	56	1.248	66	0.818
75	60.620	120	0.477	58	1.248	68	0.804
80	60.450	130	0.480	60	1.248	70	0.791
85	60.270	140	0.483	62	1.248	72	0.779
90	60.100	150	0.486	64	1.248	74	0.766
95	59.930	160	0.488	66	1.248	76	0.754
100	59.750	170	0.491	68	1.248	78	0.742
		180	0.494	70	1.248	80	0.730
		190	0.497	72	1.248	82	0.719
		200	0.500	74	1.248	84	0.708
		210	0.502	76	1.248	86	0.697
						88	0.687
						90	0.676
						92	0.666
						94	0.656
						96	0.647
						98	0.637
						100	0.628
						102	0.619

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	200	0.647	200	0.01079	90	0.170
	N	210	0.851	210	0.01398	100	0.170
	S	220	1.105	220	0.01789	110	0.170
	O	230	1.418	230	0.02263	120	0.170
	L	240	1.800	240	0.02832	130	0.170
	U	250	2.262	250	0.03507	140	0.170
	B	260	2.814	260	0.04303	150	0.170
	L	270	3.470	270	0.05233	160	0.170
	E	280	4.242	280	0.06311	170	0.170
		290	5.145	290	0.07552	180	0.170
		300	6.192	300	0.08970	190	0.170
		310	7.400	310	0.10580	200	0.170
		320	8.785	320	0.12400	210	0.170
		330	10.360	330	0.14440	220	0.170
		340	12.150	340	0.16720	230	0.170
		350	14.170	350	0.19250	240	0.170
						250	0.170
						260	0.170

# DIELDRIN

DED

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Heod endo,exo-1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4:5,8-dimethanonaphthalene	Solid          Sinks in water.	Light brown          	Mild chemical odor
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> <b>Wear goggles, dust respirator and rubber overclothing (including gloves).</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause headache, dizziness, or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. If swallowed will cause headache, nausea, dizziness, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim; Dredge Clean shore line	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>12</sub> H <sub>6</sub> Cl <sub>6</sub> O 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 2761 2.5 CAS Registry No.: 60-57-1 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 59110
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> U. S. Bu. Mines approved respirator; clean rubber gloves; goggles or face shield 3.2 <b>Symptoms Following Exposure:</b> Inhalation, ingestion, or skin contact causes irritability, convulsions and/or coma, nausea, vomiting, headache, fainting, tremors. Contact with eyes causes irritation. 3.3 <b>Treatment of Exposure:</b> INHALATION: move to fresh air; give oxygen and artificial respiration as required. INGESTION: induce vomiting and get medical attention. EYES: flush with plenty of water; get medical attention. SKIN: flush with plenty of water. 3.4 <b>TLV-TWA:</b> 0.25 mg/m <sup>3</sup> 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 4; oral LD <sub>50</sub> = 46 mg/kg (rat), 65 mg/kg (dog) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Banned by EPA in October 1974 because of alleged "imminent hazard to human health" as a potential carcinogen in man. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 3.12 <b>Odor Threshold:</b> 0.041 ppm 3.13 <b>IDLH Value:</b> 50 mg/m <sup>3</sup> 3.14 <b>OSHA PEL-TWA:</b> 0.25 mg/m <sup>3</sup> 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen chloride fumes may form in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.0079 mg/96 hr/bluegill/TL<sub>50</sub>/fresh water  
.037 ppm/96 hr/goldfish/TL<sub>50</sub>/fresh water  
0.050 ppm/5 hr/mullet/100% kill/salt water  
0.025-.050 ppm/48 hr/brown shrimp/TL<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** LD<sub>50</sub> 381.0 mg/kg  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** High  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 85+% HEOD; 18% emulsifiable concentrates in petroleum hydrocarbons, which are combustible.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) (for liquid form)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1 pound  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** P037  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 380.93  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** 349°F = 176°C = 449°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.75 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# DIELDRIN

DED

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 2,2-DICHLOROETHYL ETHER

DEE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlorex Bis (2-Chloroethyl) ether DCEE Dichlorodiethyl ether Dichloroether Di-(2-chloroethyl) ether	Liquid  Colorless  Sweet pleasant odor  Sinks and mixes slowly with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID.</b> Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 41; Ether  
2.2 Formula: (CICH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>O  
2.3 IMO/UN Designation: 3.3/1916  
2.4 DOT ID No.: 1916  
2.5 CAS Registry No.: 111-44-4  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves; protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation of vapor causes irritation of nose, coughing, nausea. Liquid irritates eyes and causes mild irritation of skin. (Can be absorbed in toxic amounts through the skin.) Ingestion causes irritation of mouth and stomach, symptoms of systemic poisoning.
- 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; support respiration; call physician if needed. EYES: irrigate with copious quantities of water for 15 min.; call physician. SKIN: wipe off, wash well with soap and water. INGESTION: induce vomiting; get medical attention.
- 3.4 **TLV-TWA:** 5 ppm  
3.5 **TLV-STEL:** 10 ppm  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 75 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Said to be carcinogenic  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 100 ppm  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 180°F O.C. 131°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** May form phosgene or hydrogen chloride in fires.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 696°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 2.4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 23.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** U025  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 143.0  
9.3 **Boiling Point at 1 atm:** 353°F = 178°C = 451°K  
9.4 **Freezing Point:** -62°F = -52°C = 221°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.22 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 37.9 dynes/cm = 0.0379 N/m at 19°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 4.93  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0743  
9.12 **Latent Heat of Vaporization:** 143 Btu/lb = 79.5 cal/g = 3.33 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -7,530 Btu/lb = -4,180 cal/g = -175 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# 2,2-DICHLOROETHYL ETHER

DEE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	77.469	42	0.366	42	0.726	42	3.753
40	77.270	44	0.367	44	0.726	44	3.686
45	77.080	46	0.368	46	0.726	46	3.619
50	76.879	48	0.369	48	0.726	48	3.555
55	76.679	50	0.370	50	0.726	50	3.492
60	76.480	52	0.371	52	0.726	52	3.431
65	76.290	54	0.372	54	0.726	54	3.372
70	76.089	56	0.373	56	0.726	56	3.313
75	75.889	58	0.374	58	0.726	58	3.257
80	75.690	60	0.376	60	0.726	60	3.201
85	75.500	62	0.377	62	0.726	62	3.147
90	75.299	64	0.378	64	0.726	64	3.095
95	75.099	66	0.379	66	0.726	66	3.043
100	74.900	68	0.380	68	0.726	68	2.993
105	74.700	70	0.381	70	0.726	70	2.944
110	74.509	72	0.382	72	0.726	72	2.897
115	74.309	74	0.383	74	0.726	74	2.850
120	74.110	76	0.384	76	0.726	76	2.804
125	73.910						
130	73.719						
135	73.520						
140	73.320						
145	73.120						
150	72.929						
155	72.730						
160	72.530						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.070	60	0.005	60	0.00012	0	0.185
		70	0.007	70	0.00018	20	0.190
		80	0.011	80	0.00026	40	0.194
		90	0.016	90	0.00038	60	0.199
		100	0.023	100	0.00055	80	0.203
		110	0.033	110	0.00078	100	0.208
		120	0.047	120	0.00109	120	0.212
		130	0.067	130	0.00150	140	0.216
		140	0.092	140	0.00205	160	0.221
		150	0.127	150	0.00277	180	0.225
		160	0.173	160	0.00371	200	0.229
		170	0.233	170	0.00492	220	0.233
		180	0.311	180	0.00647	240	0.237
		190	0.411	190	0.00842	260	0.240
		200	0.539	200	0.01088	280	0.244
		210	0.701	210	0.01394	300	0.248
		220	0.905	220	0.01774	320	0.251
		230	1.160	230	0.02240	340	0.255
		240	1.475	240	0.02809	360	0.258
		250	1.864	250	0.03500	380	0.262
		260	2.341	260	0.04333	400	0.265
		270	2.921	270	0.05333	420	0.268
		280	3.623	280	0.06524	440	0.271
		290	4.467	290	0.07938		
		300	5.479	300	0.09607		
		310	6.683	310	0.11570		

# DIETHYLENE GLYCOL

DEG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> DEG Diglycol Bis-(2-Hydroxyethyl)ether 3-Oxa-1, 5-pentanediol 2,2'-Oxybisethanol	Oily liquid  Colorless  Odorless  Sinks and mixes with water.
Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water and foam may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Not harmful.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ether
- 2.2 Formula: (HOCH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>O
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 111-46-6
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full face mask with canister for short exposures to high vapor levels; rubber gloves; goggles.
- 3.2 **Symptoms Following Exposure:** Ingestion of large amounts may cause degeneration of kidney and liver and cause death. Liquid may cause slight skin irritation.
- 3.3 **Treatment of Exposure:** INHALATION: no problem likely. If any ill effects do develop, get medical attention. INGESTION: induce vomiting if ingested. No known antidote; treat symptomatically. EYE AND SKIN: flush with water. If any ill effects occur, get medical attention.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> above 15 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Kidney and liver damage.
- 3.10 **Vapor (Gas) Irritant Characteristics:** None
- 3.11 **Liquid or Solid Characteristics:** None
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 255°F C.C.
- 4.2 **Flammable Limits in Air:** 1.6%-10.8%
- 4.3 **Fire Extinguishing Agents:** Alcohol foam, carbon dioxide, dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 444°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 1.5 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 23.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Not pertinent
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
> 32,000 ppm/96 hr/mosquito fish/TL<sub>m</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 6%, 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 2  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Regular grade; polyester grade
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 106.12
- 9.3 **Boiling Point at 1 atm:** 473°F = 245°C = 518°K
- 9.4 **Freezing Point:** 20°F = -8°C = 265°K
- 9.5 **Critical Temperature:** 766.4°F = 408°C = 681.2°K
- 9.6 **Critical Pressure:** 680 psia = 46 atm = 4.7 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.118 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** 270 Btu/lb = 150 cal/g = 6.28 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -9617 Btu/lb = -5343 cal/g = -223.7 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Very low

### NOTES

# DIETHYLENE GLYCOL

DEG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	70.809	40	0.534	65	1.442		N O T  P E R T I N E N T
50	70.440	50	0.540	70	1.442		
60	70.080	60	0.545	75	1.442		
70	69.719	70	0.551	80	1.442		
80	69.349	80	0.557	85	1.442		
90	68.990	90	0.562	90	1.442		
100	68.620	100	0.568	95	1.442		
110	68.259	110	0.573	100	1.442		
120	67.900	120	0.579	105	1.442		
130	67.530	130	0.584	110	1.442		
140	67.169	140	0.590	115	1.442		
150	66.799	150	0.595	120	1.442		
160	66.440	160	0.601	125	1.442		
170	66.070	170	0.607	130	1.442		
180	65.709	180	0.612	135	1.442		
190	65.349	190	0.618	140	1.442		
200	64.980	200	0.623	145	1.442		
210	64.620	210	0.629	150	1.442		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	80	0.000	80	0.00000		N O T  P E R T I N E N T
		100	0.000	100	0.00000		
		120	0.001	120	0.00001		
		140	0.001	140	0.00002		
		160	0.003	160	0.00005		
		180	0.008	180	0.00012		
		200	0.016	200	0.00024		
		220	0.034	220	0.00049		
		240	0.067	240	0.00095		
		260	0.128	260	0.00176		
		280	0.237	280	0.00317		
		300	0.424	300	0.00552		
		320	0.736	320	0.00933		
		340	1.243	340	0.01537		
		360	2.046	360	0.02467		
		380	3.288	380	0.03871		

# DI-(2-ETHYLHEXYL) ADIPATE

DEH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Adipic acid, bis (2-ethylhexyl) ester Bis(2-ethylhexyl) adipate	Liquid Clear to straw colored Mild odor  Floats on water.
Avoid contact with liquid and vapor. Wear rubber overclothing (including gloves). Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Wear self-contained breathing apparatus and full protective clothing. Extinguish with dry chemical, water fog, carbon dioxide, or alcohol foam. Use water spray to cool exposed containers.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Move to fresh air. Wash affected areas with plenty of soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $C_{24}H_{42}O_4$   
2.3 IMO/IUN Designation: Not listed.  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 103-23-1  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear splash goggles, impervious apron, and impervious gloves.  
3.2 **Symptoms Following Exposure:** Liquid may cause mild eye irritation. Repeated or prolonged skin contact may cause irritation.  
3.3 **Treatment of Exposure:** Call for medical aid. SKIN: Wash with soap and water. Treat like lubricating oil. EYES: Flush with water for at least 15 mins., lifting lids occasionally. INHALATION: Remove to fresh air.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 400°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, water fog, or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Use water spray to cool exposed containers.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 183.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 43.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Avoid contact with strong oxidizers.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.6%; Technical grades.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 370.58  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.923  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 12.8  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DI-(2-ETHYLHEXYL) ADIPATE

DEH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	7.700		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DIETHYL KETONE

DEK

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> DEK Dimethyl acetone Ethyl propionyl Metacetone Methacetone 3-Pentanone Propione	Liquid  Colorless  Acetone-like odor  Floats and mixes with water. Flammable, irritating vapor is produced.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective on fire. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shoreline  
Salvage waterfowl  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$   
2.3 IMO/UN Designation: 3.2/1156  
2.4 DOT ID No.: 1156  
2.5 CAS Registry No.: 96-22-0  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Organic canister or air pack; plastic gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Liquid causes eye burn. Vapor irritates eyes, nose and throat; can cause headache, dizziness, nausea, weakness, and loss of consciousness.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if breathing is irregular or has stopped, start resuscitation and administer oxygen. EYES: wash with plenty of water for at least 15 min. and call physician.  
3.4 **TLV-TWA:** 200 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 2.14 \text{ g/kg (rat)}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 55°F.C.C.  
4.2 **Flammable Limits in Air:** 1.6-6.4%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 842°F  
4.8 **Electrical Hazards:** Class 1, Group D  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  $\text{TL}_{96} = 100\text{-}1,000 \text{ ppm}$   
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 99.5 + %  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 86.13  
9.3 **Boiling Point at 1 atm:** 216°F = 102°C = 375°K  
9.4 **Freezing Point:** -44°F = -42°C = 231°K  
9.5 **Critical Temperature:** 550.4°F = 288°C = 561.2°K  
9.6 **Critical Pressure:** 543 psia = 36.9 atm = 3.74 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.8159 at 19°C (liquid)  
9.8 **Liquid Surface Tension:** 25.33 @ 15°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 2.96  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 163.4 Btu/lb = 90.8 cal/g =  $3.8 \times 10^5 \text{ J/kg}$   
9.13 **Heat of Combustion:** -15373 Btu/lb = -8541 cal/g =  $-357 \times 10^5 \text{ J/kg}$   
9.14 **Heat of Decomposition:** (est) -1542 Btu/lb = -857 cal/g =  $-35.9 \times 10^5 \text{ J/kg}$   
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.5 psia

### NOTES

# DIETHYL KETONE

DEK

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	50.800	77	0.530		C U R R E N T L Y  N O T  A V A I L A B L E	60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210	0.495 0.467 0.441 0.417 0.394 0.372 0.351 0.332 0.313 0.296 0.279 0.264 0.249 0.235 0.222 0.210

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	4.700	10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200	0.031 0.042 0.057 0.078 0.107 0.147 0.201 0.275 0.377 0.516 0.706 0.966 1.323 1.810 2.478 3.391 4.642 6.353 8.696 11.902		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.318 0.329 0.339 0.349 0.360 0.370 0.381 0.391 0.401 0.412 0.422 0.433 0.443 0.453 0.464 0.474 0.485 0.495 0.505 0.516 0.526 0.537 0.547 0.557 0.568

# 1,2-DICHLOROETHYLENE

DEL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetylene dichloride trans-1,2-Dichloroethylene cis-1,2-Dichloroethylene sym-Dichloroethylene Dioform	Liquid  Colorless  Sweet pleasant odor  Sinks in water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Wear goggles and self-contained breathing apparatus. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR If inhaled will cause dizziness, nausea, vomiting, or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump Collection Systems: Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: ClCH = CHCl 2.3 IMO/UN Designation: 3.2/1150 2.4 DOT ID No.: 1150 2.5 CAS Registry No.: 540-59-0 2.6 NAERG Guide No.: 132P 2.7 Standard Industrial Trade Classification: 51138
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Rubber gloves; safety goggles; air supply mask or self-contained breathing apparatus. 3.2 <b>Symptoms Following Exposure:</b> Inhalation causes nausea, vomiting, weakness, tremor, epigastric cramps, central nervous depression. Contact with liquid causes irritation of eyes and (on prolonged contact) skin. Ingestion causes slight depression to deep narcosis. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove from further exposure; if breathing is difficult, give oxygen; if victim is not breathing, give artificial respiration, preferably mouth-to-mouth; give oxygen when breathing is resumed; call a physician. EYES: flush with water for at least 15 min. SKIN: wash well with soap and water. INGESTION: give gastric lavage and cathartics. 3.4 TLV-TWA: 200 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; oral LD <sub>50</sub> = 770 mg/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Produces liver and kidney injury in experimental animals. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 IDLH Value: 1,000 ppm 3.14 OSHA PEL-TWA: 200 ppm 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 37°F C.C.  
4.2 Flammable Limits in Air: 9.7%-12.8%  
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Phosgene and hydrogen chloride fumes may form in fires.  
4.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
4.7 Auto Ignition Temperature: 860°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: 2.6 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 9.5 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 4.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Will not occur under ordinary conditions of shipment. The reaction is not vigorous.  
5.6 Inhibitor of Polymerization: None used

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  
Category Classification  
Health Hazard (Blue)..... 2  
Flammability (Red)..... 3  
Instability (Yellow)..... 2  
8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: U079  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 97.0  
9.3 Boiling Point at 1 atm: cis: 140°F = 60°C = 333°K trans: 118°F = 48°C = 321°K  
9.4 Freezing Point: cis: -114°F = -81°C = 192°K trans: -58°F = -50°C = 223°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.27 at 25°C (liquid)  
9.8 Liquid Surface Tension: 24 dynes/cm = 0.024 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 30 dynes/cm = 0.030 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: 3.34  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.1468  
9.12 Latent Heat of Vaporization: 130 Btu/lb = 72 cal/g = 3.0 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -4,847.2 Btu/lb = -2,692.9 cal/g = -112.67 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES



# 1,2-DICHLOROETHYLENE

DEL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	81.020	35	0.193	65	0.907	40	0.478
40	80.820	40	0.196	70	0.894	50	0.454
45	80.610	45	0.198	75	0.882	60	0.432
50	80.400	50	0.200	80	0.869	70	0.411
55	80.190	55	0.202	85	0.857	80	0.393
60	79.980	60	0.204	90	0.844	90	0.376
65	79.780	65	0.207	95	0.832	100	0.360
70	79.570	70	0.209	100	0.819	110	0.345
75	79.360	75	0.211	105	0.807	120	0.331
80	79.150	80	0.213	110	0.794	130	0.319
85	78.940	85	0.216	115	0.782	140	0.307
90	78.740	90	0.218	120	0.769	150	0.296
95	78.530	95	0.220	125	0.757	160	0.286
100	78.320	100	0.222	130	0.744	170	0.276
105	78.110	105	0.224			180	0.267
110	77.900	110	0.227			190	0.259
115	77.690	115	0.229			200	0.251
120	77.490	120	0.231			210	0.244
125	77.280	125	0.233				
130	77.070	130	0.236				
135	76.860	135	0.238				
140	76.650	140	0.240				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.630	55	3.009	55	0.05284	0	0.150
		60	3.396	60	0.05906	20	0.153
		65	3.824	65	0.06587	40	0.156
		70	4.297	70	0.07330	60	0.159
		75	4.817	75	0.08141	80	0.162
		80	5.389	80	0.09023	100	0.165
		85	6.016	85	0.09980	120	0.167
		90	6.702	90	0.11020	140	0.170
		95	7.453	95	0.12140	160	0.173
		100	8.272	100	0.13360	180	0.176
		105	9.164	105	0.14660	200	0.179
		110	10.130	110	0.16070	220	0.182
		115	11.190	115	0.17590	240	0.185
		120	12.330	120	0.19220	260	0.188
		125	13.560	125	0.20960	280	0.191
		130	14.900	130	0.22830	300	0.194
		135	16.340	135	0.24820	320	0.197
		140	17.890	140	0.26960	340	0.200
						360	0.203
						380	0.205
						400	0.208
						420	0.211
						440	0.214

# DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE

DEM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-(2-Butoxyethoxy) ethanol acetate Butyl "carbitol" acetate Diglycol monobutyl ether acetate Ektasolve DB acetate	Liquid  Colorless  Mild odor  Floats and mixes slowly with water.
<b>Keep people away.</b> <b>Avoid contact with liquid.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 34; Ester  
2.2 **Formula:** C<sub>8</sub>H<sub>16</sub>OCH<sub>2</sub>CH<sub>2</sub>OCH<sub>2</sub>CH<sub>2</sub>OCOCCH<sub>3</sub>  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 124-17-4  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Face shield or safety glasses; protective gloves; air mask for prolonged exposure to vapor.
- 3.2 **Symptoms Following Exposure:** Prolonged breathing of vapor may cause irritation and nausea. Contact with liquid may cause mild irritation of eyes and skin. Can be absorbed through skin in toxic amounts.
- 3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air; if breathing has stopped, administer artificial respiration. EYES: flush with water for at least 15 min. SKIN: wash skin with large amounts of water for 15 min.; call physician if needed. INGESTION: induce vomiting; get medical attention.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 2.34 g/kg (guinea pig)  
3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Kidney damage noted in animals following repeated contact with skin.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 240°F O.C.  
4.2 **Flammable Limits in Air:** 0.8%-5.0%  
4.3 **Fire Extinguishing Agents:** Water, alcohol foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 563°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 3.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 61.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 20.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 204.3  
9.3 **Boiling Point at 1 atm:** 475°F = 246°C = 519°K  
9.4 **Freezing Point:** -27°F = -33°C = 240°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.985 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 22 dynes/cm = 0.022 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 106 Btu/lb = 59 cal/g = 2.5 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -13,000 Btu/lb = -7,400 cal/g = -310 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -27 Btu/lb = -15 cal/g = -0.63 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE

DEM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	62.660	51	0.400	85	1.275	42	5.201
36	62.600	52	0.400	90	1.269	44	5.048
38	62.530	53	0.400	95	1.264	46	4.900
40	62.460	54	0.400	100	1.258	48	4.758
42	62.390	55	0.400	105	1.252	50	4.621
44	62.320	56	0.400	110	1.247	52	4.489
46	62.250	57	0.400	115	1.241	54	4.362
48	62.180	58	0.400	120	1.236	56	4.239
50	62.110	59	0.400	125	1.230	58	4.120
52	62.040	60	0.400	130	1.224	60	4.006
54	61.970	61	0.400	135	1.219	62	3.896
56	61.900	62	0.400	140	1.213	64	3.790
58	61.830	63	0.400	145	1.207	66	3.687
60	61.760	64	0.400	150	1.202	68	3.588
62	61.690	65	0.400	155	1.196	70	3.492
64	61.620	66	0.400	160	1.190	72	3.400
66	61.560	67	0.400	165	1.185	74	3.310
68	61.490	68	0.400	170	1.179	76	3.224
70	61.420	69	0.400			78	3.140
72	61.350	70	0.400			80	3.060
74	61.280	71	0.400			82	2.982
76	61.210	72	0.400			84	2.906
78	61.140	73	0.400			86	2.833
80	61.070	74	0.400				
82	61.000	75	0.400				
84	60.930	76	0.400				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	6.500	270	0.168	270	0.00439		N
		280	0.222	280	0.00570		O
		290	0.290	290	0.00736		T
		300	0.376	300	0.00943		
		310	0.485	310	0.01200		P
		320	0.622	320	0.01519		E
		330	0.792	330	0.01909		R
		340	1.003	340	0.02386		T
		350	1.262	350	0.02966		I
		360	1.579	360	0.03666		N
		370	1.965	370	0.04508		E
		380	2.433	380	0.05515		N
		390	2.997	390	0.06714		T
		400	3.675	400	0.08135		
		410	4.484	410	0.09813		
		420	5.447	420	0.11780		
		430	6.587	430	0.14090		
		440	7.933	440	0.16780		
		450	9.515	450	0.19910		
		460	11.370	460	0.23520		
		470	13.530	470	0.27690		
		480	16.040	480	0.32490		

# DIETHYLAMINE

DEN

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms DEN	Watery liquid	Colorless	Fishy, ammonia odor
	Floats and mixes with water. Flammable, irritating vapor is produced.		
Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.			
Fire	FLAMMABLE. Flashback along vapor trail may occur. Irritating vapors are produced when heated. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, alcohol foam or carbon dioxide. Cool exposed containers with water.		
Exposure	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
Water Pollution	Harmful to aquatic life in very low concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amine  
2.2 Formula:  $(\text{CH}_3\text{CH}_2)_2\text{NH}$   
2.3 IMO/UN Designation: 3.1/1154  
2.4 DOT ID No.: 1154  
2.5 CAS Registry No.: 109-89-7  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles, rubber gloves, and apron.  
3.2 **Symptoms Following Exposure:** Irritation and burning of eyes, skin, and respiratory system. High concentration of vapor can cause asphyxiation.  
3.3 **Treatment of Exposure:** In case of contact, flush skin or eyes with plenty of water for at least 15 min.; for eyes, get medical attention.  
3.4 **TLV-TWA:** 5 ppm  
3.5 **TLV-STEL:** 15 ppm  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.14 ppm  
3.13 **IDLH Value:** 200 ppm  
3.14 **OSHA PEL-TWA:** 25 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 5°F O.C.  
4.2 **Flammable Limits in Air:** 1.8%-10.1%  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or alcohol foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Vapors are irritating  
4.6 **Behavior in Fire:** Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 594°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 6.7 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 36.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No hazardous reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 85 mg/l/48 hr/creek chub/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 99%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 73.14  
9.3 **Boiling Point at 1 atm:** 132°F = 55.5°C = 328.7°K  
9.4 **Freezing Point:** -57.6°F = -49.8°C = 223.4°K  
9.5 **Critical Temperature:** 434.3°F = 223.5°C = 496.7°K  
9.6 **Critical Pressure:** 538 psia = 36.6 atm = 3.71 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.708 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 20.05 dynes/cm = 0.02005 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.079  
9.12 **Latent Heat of Vaporization:** 170 Btu/lb = 93 cal/g =  $3.9 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -17,990 Btu/lb = -9994 cal/g =  $-418.4 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -202 Btu/lb = -112 cal/g =  $-4.69 \times 10^5$  J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.7 psia

### NOTES

# DIETHYLAMINE

DEN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	45.340	20	0.575	35	0.906		C U R R E N T L Y  N O T  A V A I L A B L E
40	45.160	30	0.580	40	0.898		
45	44.980	40	0.585	45	0.890		
50	44.800	50	0.590	50	0.882		
55	44.620	60	0.595	55	0.874		
60	44.440	70	0.601	60	0.866		
65	44.260	80	0.606	65	0.858		
70	44.090	90	0.611	70	0.850		
75	43.910	100	0.616	75	0.842		
80	43.730	110	0.621	80	0.834		
85	43.550	120	0.626	85	0.826		
90	43.370	130	0.632	90	0.818		
95	43.190			95	0.809		
100	43.010			100	0.801		
105	42.840			105	0.793		
110	42.660			110	0.785		
115	42.480			115	0.777		
120	42.300			120	0.769		
				125	0.761		
				130	0.753		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		35	1.613	35	0.02222	0	0.335
		40	1.846	40	0.02518	25	0.349
		45	2.107	45	0.02845	50	0.363
		50	2.399	50	0.03208	75	0.377
		55	2.725	55	0.03607	100	0.391
		60	3.087	60	0.04047	125	0.405
		65	3.488	65	0.04530	150	0.418
		70	3.933	70	0.05059	175	0.432
		75	4.425	75	0.05639	200	0.445
		80	4.967	80	0.06271	225	0.458
		85	5.564	85	0.06960	250	0.471
		90	6.220	90	0.07709	275	0.484
		95	6.939	95	0.08523	300	0.497
		100	7.726	100	0.09405	325	0.510
		105	8.586	105	0.10360	350	0.523
		110	9.524	110	0.11390	375	0.535
		115	10.550	115	0.12500	400	0.548
		120	11.660	120	0.13700	425	0.560
						450	0.572
						475	0.584
						500	0.596
						525	0.607
						550	0.619
						575	0.631
						600	0.642

# DI-(2-ETHYLHEXYL)PHOSPHORIC ACID

DEP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> DEHPA Di-(2-ethylhexyl) phosphoric acid Di-(2-ethylhexyl) phosphate 2-Ethyl-1-hexanol hydrogen phosphate Bis-(2-Ethylhexyl)hydrogen phosphate	Liquid  Light yellow  Odorless  Floats on water.
<b>Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water and foam may be ineffective on fire.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Neutralize; Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  
[CH3CH2CH2CH2CH(C2H5)CH2O]3POOH  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 1902  
2.5 CAS Registry No.: 298-07-7  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification:  
51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves; protective clothing.
- 3.2 **Symptoms Following Exposure:** Contact with liquid irritates eyes and may cause serious injury; consult an eye specialist. Also causes skin irritation on contact. Ingestion produces irritation similar to that caused by strong vinegar.
- 3.3 **Treatment of Exposure:** EYES: immediately flush with plenty of water for at least 15 min.; see a physician. SKIN: immediately flush with plenty of water for at least 15 min. INGESTION: induce vomiting and call a physician.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to the eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 385°F O.C.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.
- 4.5 **Special Hazards of Combustion Products:** Irritating phosphorus oxides may be released.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 115.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 33.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Mildly corrosive to most metals; may form flammable hydrogen gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate or lime solution
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 92+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 322.4
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** < -76°F = < -60°C = < 213°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.977 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** -13,970 Btu/lb = -7,760 cal/g = -325 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DI-(2-ETHYLHEXYL)PHOSPHORIC ACID

DEP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	61.540	82	0.396	51	1.048	52	123.099
54	61.470	84	0.398	52	1.048	54	110.400
56	61.400	86	0.400	53	1.048	56	98.990
58	61.330	88	0.402	54	1.048	58	88.870
60	61.260	90	0.404	55	1.048	60	79.839
62	61.190	92	0.406	56	1.048	62	71.799
64	61.130	94	0.408	57	1.048	64	64.610
66	61.060	96	0.410	58	1.048	66	58.190
68	60.990	98	0.412	59	1.048	68	52.450
70	60.920	100	0.414	60	1.048	70	47.320
72	60.850	102	0.416	61	1.048	72	42.720
74	60.780	104	0.418	62	1.048	74	38.600
76	60.710	106	0.420	63	1.048	76	34.900
78	60.640	108	0.422	64	1.048	78	31.580
80	60.570	110	0.424	65	1.048	80	28.590
82	60.500	112	0.426	66	1.048	82	25.910
84	60.430	114	0.428	67	1.048	84	23.500
86	60.360	116	0.430	68	1.048	86	21.320
		118	0.432	69	1.048		
		120	0.434	70	1.048		
		122	0.436	71	1.048		
		124	0.438	72	1.048		
		126	0.440	73	1.048		
		128	0.442	74	1.048		
		130	0.444	75	1.048		
		132	0.446	76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.010		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BUTYL, DECYL, CETYL-EICOSYL METHACRYLATE

DER

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butyl, decyl, cetyl, eicosyl 2-methyl-2-propenoate Methacrylic acid, butyl, decyl, cetyl and eicosyl ester mix	Liquid  Colorless  Mild odor  Floats on water.
Keep people away. Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Containers may explode in fire. Water may be ineffective on fire. Extinguish with dry chemicals, foam or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR May be harmful if inhaled or skin is exposed. Irritating to the eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED, and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and waterlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 14; Acrylate  
2.2 Formula: Mixture of  $RC_4H_9$ ,  $RC_{10}H_{21}$ ,  $RC_{16}H_{33}$ , and  $RC_{22}H_{45}$  where R is  $CH_2=C(CH_3)COO$   
2.3 IMO/UN Designation: /2227  
2.4 DOT ID No.: 2227  
2.5 CAS Registry No.: Not pertinent  
2.6 NAERG Guide No.: 129P  
2.7 Standard Industrial Trade Classification: 51373

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained respirator; impervious gloves; chemical splash goggles  
3.2 **Symptoms Following Exposure:** Inhalation may cause nausea because of offensive odor. Contact with liquid causes irritation of skin. Ingestion causes irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air, give oxygen or artificial respiration as required. EYES: Flush with copious amounts of water for 15 min. and consult physician. SKIN: Wash with soap and water. INGESTION: Induce vomiting; call a physician.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Birth defects in rats (gross and skeletal abnormalities).  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will usually not tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Containers may explode.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** May occur when heated or exposed to light.  
5.6 **Inhibitor of Polymerization:** 10 ppm of hydroquinone monomethyl ether

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Not pertinent  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

### NOTES



# BUTYL, DECYL, CETYL-EICOSYL METHACRYLATE

DER

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# 2,4-D ESTERS

DES

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butyl 2,4-dichlorophenoxyacetate 2,4-Dichlorophenoxyacetic acid, butoxyethyl ester Isopropyl 2, 4-dichlorophenoxy acetate	Liquid  Yellowish brown  Fuel oil-like odor  Sinks in water.
<b>Keep people away.</b> <b>Shut off ignition sources. Call fire department.</b> <b>Avoid contact with liquid.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Irritating gases may be produced when heated. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump  
Clean shore line  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** 2,4-Cl<sub>2</sub>C<sub>6</sub>H<sub>3</sub>OC(=O)R, where  
R=C<sub>4</sub>H<sub>9</sub>, C<sub>3</sub>H<sub>7</sub>, or CH<sub>2</sub>CH<sub>2</sub>OC<sub>4</sub>H<sub>9</sub>  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** 2765  
2.5 **CAS Registry No.:** 94-11-1  
2.6 **NAERG Guide No.:** 152  
2.7 **Standard Industrial Trade Classification:**  
51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Face shield or goggles, rubber gloves  
3.2 **Symptoms Following Exposure:** Contact with eyes may cause mild irritation.  
3.3 **Treatment of Exposure:** INGESTION: if large amounts are swallowed, induce vomiting and get medical help. EYES: flush with plenty of water and see a doctor. SKIN: flush with water, wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2 or 3; LD<sub>50</sub> = 320-617 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
> 175°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride vapor may form in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May attack some forms of plastics  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
350 ppm/24 hr/bass, bluegill/50% kill/ fresh water  
1.0-5.0 ppm/96 hr/oyster/39% shell growth disease/salt water  
6.2 **Waterfowl Toxicity:** LD<sub>50</sub> = 2025.0 mg/kg  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 99%; 64% in petroleum oil  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U240  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 234-291  
9.3 **Boiling Point at 1 atm:** Very high  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.088-1.237 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2,4-D ESTERS

DES

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	71.790		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DIETHYLENETRIAMINE

DET

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bis-(2-Aminoethyl) amine 2,2'-Diaminodiethylamine	Liquid  Colorless to yellow  Ammonia odor  Floats and mixes with water.
Keep people away. Avoid contact with liquid. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: T; Aliphatic amine  
2.2 Formula:  $\text{NH}_2(\text{CH}_2)_2\text{NH}(\text{CH}_2)_2\text{NH}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2079  
2.5 CAS Registry No.: 111-40-0  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 51452

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Amine respiratory cartridge mask; rubber gloves; splash- proof goggles.  
3.2 **Symptoms Following Exposure:** Prolonged breathing of vapors may cause asthma. Liquid burns skin and eyes. A skin rash can form.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. INGESTION: do NOT induce vomiting; give large quantities of water; give at least one ounce of vinegar in an equal amount of water; get medical attention. SKIN CONTACT: flush with plenty of water. EYE CONTACT: flush with plenty of water for at least 15 min. and get medical attention.  
3.4 **TLV-TWA:** 1 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** 10 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 210°F O.C.  
4.2 **Flammable Limits in Air:** (calc.) 1%-10%  
4.3 **Fire Extinguishing Agents:** Water spray, alcohol foam, carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 676°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 48.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No hazardous reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 710 ppm/24 hr/brine shrimp/TL<sub>m</sub>  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** 23% of theoretical in 5 days/freshwater acclimated seed  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98-99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 103.17  
9.3 **Boiling Point at 1 atm:** 405°F = 207°C = 480°K  
9.4 **Freezing Point:** -38°F = -39°C = 234°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.954 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -13,300 Btu/lb = -7,390 cal/g = -309 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -13 Btu/lb = -7 cal/g = -0.3 X 10<sup>3</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.02 psia

### NOTES

# DIETHYLENETRIAMINE

DET

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	60.110	85	0.673		N		N
54	60.040	90	0.676		O		O
56	59.970	95	0.678		T		T
58	59.900	100	0.681				
60	59.830	105	0.683		P		P
62	59.760	110	0.685		E		E
64	59.690	115	0.688		R		R
66	59.620	120	0.690		T		T
68	59.550	125	0.692		I		I
70	59.480	130	0.695		N		N
72	59.410	135	0.697		E		E
74	59.340	140	0.699		N		N
76	59.270	145	0.702		T		T
78	59.200	150	0.704				
80	59.140						
82	59.070						
84	59.000						
86	58.930						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	60	0.005	60	0.00010		N
	I	80	0.011	80	0.00020		O
	S	100	0.022	100	0.00038		T
	C	120	0.041	120	0.00069		
	I	140	0.075	140	0.00120		P
	B	160	0.131	160	0.00203		E
	L	180	0.220	180	0.00331		R
	E	200	0.360	200	0.00524		T
		220	0.570	220	0.00806		I
		240	0.881	240	0.01210		N
		260	1.328	260	0.01773		E
		280	1.958	280	0.02544		R
		300	2.828	300	0.03578		T
		320	4.009	320	0.04942		I
		340	5.585	340	0.06713		N
		360	7.656	360	0.08977		E
		380	10.340	380	0.11830		N

# DIETHYLZINC

DEZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethylzinc Zinc diethyl Zinc ethyl		Watery liquid      Colorless
		IGNITES WHEN EXPOSED TO AIR. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.		
<b>Fire</b>	IGNITES WHEN EXPOSED TO AIR. Extinguish with dry graphite, soda ash, or other inert powder. DO NOT USE WATER, FOAM, CARBON DIOXIDE, DRY CHEMICALS OR VAPORIZING LIQUIDS ON FIRE. DO NOT USE WATER ON ADJACENT FIRES.	
<b>Exposure</b>	Call for medical aid.  VAPOR OR DUST Irritating to eyes, nose and throat. If inhaled will cause headache, or difficult breathing. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea, and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: (C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>Zn
- 2.3 IMO/UN Designation: 4.2/1366
- 2.4 DOT ID No.: 1366
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 135
- 2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Cartridge-type or fresh air mask for fumes or smoke; PVC fire-retardant or asbestos gloves; full face shield, safety glasses, or goggles; fire-retardant coveralls as standard wear; for special cases, use asbestos coat or rain suit.
- 3.2 **Symptoms Following Exposure:** Inhalation of mist or vapor causes immediate irritation of nose and throat; excessive or prolonged inhalation of fumes from ignition or decomposition may cause "metal fume fever" (sore throat, headache, fever, chills, nausea, vomiting, muscular aches, perspiration, constricting sensation in lungs, weakness, sometimes prostration); symptoms usually last 12-24 hrs., with complete recovery in 24-48 hrs. Eyes are immediately and severely irritated on contact with liquid, vapor, or dilute solution; without thorough irrigation, cornea may be permanently damaged. Moisture in skin combines with chemical to cause thermal and acid burns; tissue may be scarred without prompt treatment. Ingestion is unlikely but would cause immediate burns at site of contact; pain, nausea, vomiting, cramps, and diarrhea may follow; if untreated, tissue may become ulcerated.
- 3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air and call doctor immediately; give mouth-to-mouth resuscitation if needed; keep victim warm and comfortable; oxygen should be given only by experienced person, and only on doctor's instructions. EYES: flush with large amounts of running water for at least 15 min., holding eyelids apart to insure thorough washing; get medical attention as soon as possible; do not use chemical neutralizers, and avoid oils or ointments unless prescribed by doctor. SKIN: flush affected area with large amounts of water, do not use chemical neutralizers; get medical attention if irritation persists. INGESTION: do NOT induce vomiting; have victim drink large amounts of water or milk immediately; if vomiting occurs, give more fluids; get medical attention.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Not pertinent
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Not pertinent
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent (ignites spontaneously)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Dry chemical, sand, or powdered limestone
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam, halogenated agents, carbon dioxide
- 4.5 **Special Hazards of Combustion Products:** Yields zinc oxide fumes when burning; can cause "metal fume fever" (see 5.2)
- 4.6 **Behavior in Fire:** Reacts spontaneously with air or oxygen, and violently with water, evolving flammable ethane gas. Contact with water applied to adjacent fires will intensify the fire.
- 4.7 **Auto Ignition Temperature:** Below 0°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently to form flammable ethane gas.
- 5.2 **Reactivity with Common Materials:** Will react with surface moisture, generating flammable ethane gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Not pertinent
- 6.2 **Waterfowl Toxicity:** Not pertinent
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95-98%. Also shipped as 15-25% by weight solutions in hydrocarbon solvents.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Inerted with dry nitrogen gas
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Spontaneously Combustible
- 8.2 **49 CFR Class:** 4.2
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	3
Instability (Yellow).....	3
Special (White).....	W
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 123.5
- 9.3 **Boiling Point at 1 atm:** 255°F = 124°C = 397°K
- 9.4 **Freezing Point:** -18°F = -28°C = 245°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.207 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** 120 Btu/lb = 68 cal/g = 2.8 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -11,700 Btu/lb = -6,495 cal/g = -272 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIETHYLZINC

DEZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	76.429	42	0.400	42	1.129	42	0.876
44	76.360	44	0.400	44	1.129	44	0.859
46	76.290	46	0.400	46	1.129	46	0.843
48	76.219	48	0.400	48	1.129	48	0.828
50	76.150	50	0.400	50	1.129	50	0.813
52	76.089	52	0.400	52	1.129	52	0.798
54	76.020	54	0.400	54	1.129	54	0.784
56	75.950	56	0.400	56	1.129	56	0.770
58	75.879	58	0.400	58	1.129	58	0.756
60	75.809	60	0.400	60	1.129	60	0.743
62	75.740	62	0.400	62	1.129	62	0.730
64	75.669	64	0.400	64	1.129	64	0.718
66	75.599	66	0.400	66	1.129	66	0.705
68	75.530	68	0.400	68	1.129	68	0.693
70	75.459	70	0.400	70	1.129	70	0.682
72	75.389	72	0.400	72	1.129	72	0.670
74	75.320	74	0.400	74	1.129	74	0.659
76	75.250	76	0.400	76	1.129	76	0.648

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	60	0.232	60	0.00513		N
	E	70	0.309	70	0.00671		O
	A	80	0.408	80	0.00869		T
	C	90	0.533	90	0.01115		
	T	100	0.689	100	0.01417		P
	S	110	0.884	110	0.01785		E
		120	1.123	120	0.02230		R
		130	1.416	130	0.02764		T
		140	1.772	140	0.03400		I
		150	2.201	150	0.04154		N
		160	2.715	160	0.05040		E
		170	3.326	170	0.06077		N
		180	4.049	180	0.07282		T
		190	4.899	190	0.08676		
		200	5.894	200	0.10280		
		210	7.052	210	0.12120		

# DIFLUOROPHOSPHORIC ACID

DFA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Difluorophosphorous acid	Liquid  Colorless  Sharp, irritating odor  Reacts violently with water. Irritating gas is produced on contact with water.
Evacuate. KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: HOPOF<sub>2</sub>  
2.3 IMO/UN Designation: 8/1768  
2.4 DOT ID No.: 1768  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 52236

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air line mask or self-contained breathing apparatus; full protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory tract. Contact with liquid causes severe irritation of eyes and skin. Ingestion causes severe burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention as soon as possible following exposures to this compound. INHALATION: remove from exposure and support respiration. EYES: wash with copious volumes of water for at least 15 min. SKIN: wash with large amounts of water for 15 min. INGESTION: if victim is conscious, have him drink large amounts of water followed by milk or milk of magnesia.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water on adjacent fires.
- 4.5 **Special Hazards of Combustion Products:** Irritating and toxic fumes of hydrogen fluoride and phosphoric acid may be formed in fires.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously to form corrosive and toxic hydrofluoric acid.
- 5.2 **Reactivity with Common Materials:** In the presence of moisture, is corrosive to glass, other siliceous materials, and most metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** FP Acid No. 2, 90+%; Commercial, 96+% plus 3.5% monofluorophosphoric acid
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 103.0
- 9.3 **Boiling Point at 1 atm:** 241°F = 116°C = 389°K
- 9.4 **Freezing Point:** -139°F = -95°C = 178°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.583 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** 140 Btu/lb = 77 cal/g = 3.2 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# DIFLUOROPHOSPHORIC ACID

DFA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	99.809	51	0.500	51	1.209		N O T  P E R T I N E N T
36	99.740	52	0.500	52	1.209		
38	99.669	53	0.500	53	1.209		
40	99.599	54	0.500	54	1.209		
42	99.530	55	0.500	55	1.209		
44	99.459	56	0.500	56	1.209		
46	99.389	57	0.500	57	1.209		
48	99.320	58	0.500	58	1.209		
50	99.250	59	0.500	59	1.209		
52	99.179	60	0.500	60	1.209		
54	99.110	61	0.500	61	1.209		
56	99.040	62	0.500	62	1.209		
58	98.969	63	0.500	63	1.209		
60	98.900	64	0.500	64	1.209		
62	98.830	65	0.500	65	1.209		
64	98.770	66	0.500	66	1.209		
66	98.700	67	0.500	67	1.209		
68	98.629	68	0.500	68	1.209		
70	98.559	69	0.500	69	1.209		
72	98.490	70	0.500	70	1.209		
74	98.419	71	0.500	71	1.209		
76	98.349	72	0.500	72	1.209		
78	98.280	73	0.500	73	1.209		
80	98.209	74	0.500	74	1.209		
82	98.139	75	0.500	75	1.209		
84	98.070	76	0.500	76	1.209		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	125	1.921	125	0.03153		N O T  P E R T I N E N T
	E	130	2.132	130	0.03469		
	A	135	2.362	135	0.03811		
	C	140	2.613	140	0.04180		
	T	145	2.885	145	0.04577		
	S	150	3.180	150	0.05005		
		155	3.500	155	0.05463		
		160	3.846	160	0.05955		
		165	4.220	165	0.06482		
		170	4.624	170	0.07046		
		175	5.058	175	0.07648		
		180	5.526	180	0.08290		
		185	6.029	185	0.08974		
		190	6.569	190	0.09703		
		195	7.148	195	0.10480		
		200	7.768	200	0.11300		
		205	8.432	205	0.12170		
		210	9.140	210	0.13100		
		215	9.897	215	0.14080		
		220	10.700	220	0.15110		
		225	11.560	225	0.16200		
		230	12.480	230	0.17360		
		235	13.450	235	0.18570		
		240	14.480	240	0.19860		
		245	15.570	245	0.21210		

# 1,1-DIFLUOROETHANE

DFE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethylidene difluoride Ethylidene fluoride Refrigerant 152A		Liquefied compressed gas Colorless
		Sinks and boils in water. Flammable, irritating vapor is produced. Visible vapor cloud is produced. Boiling point is 76°F.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies.		
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Stop flow of gas if possible. Let fire burn. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn eyes. Will cause frostbite. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.	
<b>Water Pollution</b>	Not harmful to aquatic life.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CH<sub>2</sub>CHF<sub>2</sub>  
2.3 IMO/UN Designation: 2/1030  
2.4 DOT ID No.: 1030  
2.5 CAS Registry No.: 75-37-6  
2.6 NAERG Guide No.: 115  
2.7 Standard Industrial Trade Classification: 51137

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Individual breathing devices with air supply; neoprene gloves; protective clothing; eye protection  
3.2 **Symptoms Following Exposure:** Inhalation of concentrated gas will cause suffocation. Contact with liquid can damage eyes because of low temperature. Frostbite may result from contact with liquid.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; use artificial respiration if necessary. EYES: get medical attention if liquid has entered eyes. SKIN: soak in lukewarm water (for frostbite).  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Not pertinent (boils at -24.7°C)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent  
4.2 **Flammable Limits in Air:** 3.7%-18%  
4.3 **Fire Extinguishing Agents:** Shut off gas source; use water to cool adjacent combustibles.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Irritating hydrogen fluoride fumes may form in fire.  
4.6 **Behavior in Fire:** Containers may explode. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 11.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas  
8.2 **49 CFR Class:** 2.1  
8.3 **49 CFR Package Group:** Not pertinent.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
9.2 **Molecular Weight:** 66.05  
9.3 **Boiling Point at 1 atm:** 52.3°F = 11.3°C = 248.5°K  
9.4 **Freezing Point:** -179°F = -117°C = 156°K  
9.5 **Critical Temperature:** 236.3°F = 113.5°C = 386.7°K  
9.6 **Critical Pressure:** 652 psia = 44.37 atm = 4.50 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.95 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 11.25 dynes/cm = 0.01125 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 2.3  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.141  
9.12 **Latent Heat of Vaporization:** 140.5 Btu/lb = 78.03 cal/g = 3.265 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -7,950 Btu/lb = -4,420 cal/g = -185 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1,1-DIFLUOROETHANE

DFE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T	-10 -5 0 5 10 15 20 25 30 35 40 45 50	0.346 0.337 0.328 0.321 0.313 0.306 0.299 0.292 0.286 0.279 0.274 0.268 0.263

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	-10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85	15.460 17.370 19.470 21.770 24.290 27.030 30.020 33.260 36.780 40.590 44.700 49.130 53.910 59.040 64.549 70.450 76.770 83.520 90.709 98.379	-10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85	0.21150 0.23510 0.26060 0.28830 0.31820 0.35040 0.38500 0.42230 0.46210 0.50480 0.55040 0.59900 0.65080 0.70590 0.76430 0.82620 0.89180 0.96110 1.03400 1.11100	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.220 0.229 0.237 0.245 0.253 0.261 0.269 0.277 0.284 0.291 0.298 0.305 0.312 0.319 0.326 0.332 0.338 0.344 0.350 0.356 0.362 0.368 0.373 0.379 0.384

# DISTILLATES: FLASHED FEED STOCKS

DFF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Petroleum distillate	Liquid Colorless Gasoline-like odor  Floats on water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	Flammable. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with foam or dry chemicals. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUIDS Irritating to eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** Not pertinent  
2.3 **IMO/UN Designation:** 3.1, 3.2, 3.3/1268  
2.4 **DOT ID No.:** 1268  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 128  
2.7 **Standard Industrial Trade Classification:** 33590

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Currently not available  
3.2 **Symptoms Following Exposure:** INHALATION: irritation of upper respiratory tract; dizziness, headache, coma, respiratory arrest; cardiac arrhythmias may occur. ASPIRATION: severe lung irritation, coughing, pulmonary edema, signs of bronchopneumonia; acute central nervous system excitation, followed by depression. INGESTION: irritation of mouth and stomach, other symptoms as above.  
3.3 **Treatment of Exposure:** Seek medical attention. INHALATION: maintain respiration, administer oxygen. ASPIRATION: enforce bed rest; administer oxygen. INGESTION: do NOT induce vomiting; lavage carefully if appreciable quantity was swallowed; guard against aspiration into lungs. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.25 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
(a) <0°F C.C. (b) 0-73°F C.C. (c) 73-141°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Class I, group D  
4.9 **Burning Rate:** Approx. 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
90 ppm/24 hr/juvenile American shad/  
TL<sub>50</sub>/fresh water  
91 ppm/24 hr/juvenile American shad/  
TL<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 8%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Composition varies with range of distillation temperatures used.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 58-275°F = 14-135°C = 287-408°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.71-0.75 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** 19-23 dynes/cm = 0.019-0.023 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 49-51 51 dynes/cm = 0.049-0.051 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.054  
9.12 **Latent Heat of Vaporization:** 130-150 Btu/lb = 71-81 cal/g = 3.0-3.4 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -18,720 Btu/lb = -10,400 cal/g = 435.4 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DISTILLATES: FLASHED FEED STOCKS

DFF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	45.070	35	0.472	50	0.886	35	0.519
40	44.910	40	0.475	55	0.892	40	0.501
45	44.760	45	0.478	60	0.878	45	0.485
50	44.600	50	0.480	65	0.873	50	0.469
55	44.440	55	0.483	70	0.869	55	0.454
60	44.290	60	0.486	75	0.864	60	0.440
65	44.130	65	0.488	80	0.860	65	0.426
70	43.980	70	0.491	85	0.855	70	0.414
75	43.820	75	0.493	90	0.851	75	0.401
80	43.660	80	0.496	95	0.847	80	0.390
85	43.510	85	0.499	100	0.842	85	0.379
90	43.350	90	0.501	105	0.838	90	0.368
95	43.200	95	0.504	110	0.833	95	0.358
100	43.040	100	0.507	115	0.829	100	0.348
105	42.880	105	0.509	120	0.824	105	0.339
110	42.730			125	0.820	110	0.330
115	42.570			130	0.816	115	0.322
120	42.420			135	0.811	120	0.314
125	42.260					125	0.306
130	42.100					130	0.299
135	41.950					135	0.291
140	41.790					140	0.285
145	41.640					145	0.278
150	41.480					150	0.272
155	41.320					155	0.266
160	41.170					160	0.260

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	0	0.067		N		N
	N	10	0.100		O		O
	S	20	0.145		T		T
	O	30	0.207				
	L	40	0.291		P		P
	U	50	0.402		E		E
	B	60	0.546		R		R
	L	70	0.732		T		T
	E	80	0.968		I		I
		90	1.265		N		N
		100	1.633		E		E
		110	2.085		N		N
		120	2.635		T		T
		130	3.299				
		140	4.093				
		150	5.035				
		160	6.145				
		170	7.443				
		180	8.951				
		190	10.690				
		200	12.690				
		210	14.980				
		220	17.570				
		230	20.500				
		240	23.800				
		250	27.490				

# DICHLOROMONOFLUOROMETHANE

DFM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dichlorofluoromethane F-21 Fluorodichloromethane Freon 21 Halocarbon 21 Halon 112 R-21 Refrigerant 21	Liquid or compressed gas Colorless Slight ether-like odor
<b>Keep people away. Avoid contact with liquid or vapor. Stay upwind; keep out of low areas. Wear self-contained positive pressure breathing apparatus and full protective clothing. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Nonflammable. Container may explode in heat of fire. Move container from fire area if you can do it without risk. Stay away from ends of tanks. Cool containers that are exposed to flames with water from the side until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPORS Vapors may cause dizziness or suffocation. Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Contact with liquid may cause frostbite. Remove contaminated clothing and shoes. Flush affected areas with plenty of lukewarm water. DO NOT USE HOT WATER.
<b>Water Pollution</b>	Not pertinent

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CHCl}_2\text{F}$
- 2.3 IMO/UN Designation: 2.2/1029
- 2.4 DOT ID No.: 1029
- 2.5 CAS Registry No.: 75-43-4
- 2.6 NAERG Guide No.: 126
- 2.7 Standard Industrial Trade Classification: 51138

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained positive pressure breathing apparatus, rubber gloves, safety goggles, safety shoes.
- 3.2 **Symptoms Following Exposure:** INHALATION: May cause giddiness, light-headedness, disorientation, nausea, vomiting, narcosis, cardiac dysrhythmias, hypotension, and death. SKIN: May cause frostbite or irritation. EYES: May cause irritation or cold injury.
- 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SKIN: Remove contaminated clothing. Flush affected areas with lukewarm water. DO NOT USE HOT WATER. Contact a physician. EYES: Flush with plenty of running water for at least 15 minutes, holding eyelids open if necessary.
- 3.4 **TLV-TWA:** 10 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing or skin, may cause frostbite.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 5,000 ppm
- 3.14 **OSHA PEL-TWA:** 1000 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** None
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic fumes of chlorine and fluorine may be produced in fire.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 1022°F
- 4.8 **Electrical Hazards:** None
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Not pertinent
- 6.2 **Waterfowl Toxicity:** Not pertinent
- 6.3 **Biological Oxygen Demand (BOD):** Not pertinent
- 6.4 **Food Chain Concentration Potential:** Not pertinent
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Nonflammable Gas
- 8.2 **49 CFR Class:** 2.2
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 102.92
- 9.3 **Boiling Point at 1 atm:** 48°F = 8.9°C = 282°K
- 9.4 **Freezing Point:** -211°F = -135°F = 138°K
- 9.5 **Critical Temperature:** 353.3°F = 178.5°C = 451.7°K
- 9.6 **Critical Pressure:** 749.5 psia = 51 atm = 5.2 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.48 at 20°C
- 9.8 **Liquid Surface Tension:** 18 dyne/cm = .018 N/m @ 25°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 3.55
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** 104.2 Btu/lb = 57.9 cal/g = 2.42 x 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 42.9 psia

### NOTES

# DICHLOROMONOFUOROMETHANE

DFM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
48	87.710		C U R R E N T L Y  N O T  A V A I L A B L E	40 50 60 70 80 90 100 110 120 130 140 150 160	0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920 0.920	80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180	0.338 0.333 0.327 0.322 0.317 0.311 0.306 0.300 0.295 0.289 0.284 0.279 0.273 0.268 0.262 0.257 0.251 0.246 0.240 0.235 0.230

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.950	-130 -120 -110 -100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30	0.036 0.052 0.075 0.107 0.153 0.219 0.313 0.448 0.641 0.917 1.311 1.876 2.684 3.839 5.492 7.857 11.239	48	0.29000	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.128 0.131 0.133 0.136 0.139 0.141 0.144 0.147 0.150 0.152 0.155 0.158 0.160 0.163 0.166 0.168 0.171 0.174 0.176 0.179 0.182 0.184 0.187 0.190 0.192

# DIETHYLENE GLYCOL ETHYL ETHER ACETATE

DGA

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless
<b>Wear full impervious protective clothing and approved respirator.</b> Avoid contact with vapor. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.		
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $\text{CH}_3\text{COOCH}_2\text{OCH}_2\text{CH}_2\text{OC}_2\text{H}_5$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 112-15-2  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 230°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Not listed.
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 162.118
- 9.3 **Boiling Point at 1 atm:** 423.32°F = 217.4°C = 490.4°K
- 9.4 **Freezing Point:** -13°F = -25°C = 248°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.0114 @ 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# DIETHYLENE GLYCOL ETHYL ETHER ACETATE

DGA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	8.440		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DIETHYLENE GLYCOL DIMETHYL ETHER

DGD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diglyme Bis-(2-Methoxyethyl)-ether Poly solv	Watery liquid  Colorless  Pleasant odor  Floats and mixes with water.
Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID If swallowed, will cause nausea, vomiting, or loss of consciousness. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $(CH_3OCH_2CH_2)_2O$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Vinyl (not rubber) gloves; safety goggles.  
3.2 Symptoms Following Exposure: INGESTION (severe cases): nausea, vomiting, abdominal cramps, weakness progressing to coma.  
3.3 Treatment of Exposure: INGESTION: give water and induce vomiting; oxygen and artificial respiration as needed.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: None  
3.11 Liquid or Solid Characteristics: None  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEG1: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 158°F O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 38.1 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 13.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	1

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 134.12  
9.3 Boiling Point at 1 atm: 324°F = 162°C = 435°K  
9.4 Freezing Point: -94°F = -70°C = 203°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.945 at 20°C (liquid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: 130 Btu/lb = 74 cal/g =  $3.1 \times 10^5$  J/kg  
9.13 Heat of Combustion: (est.) -11,300 Btu/lb = -6,260 cal/g =  $-262 \times 10^5$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

NOTES

# DIETHYLENE GLYCOL DIMETHYL ETHER

DGD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	59.540	85	0.498		N		N
54	59.480	90	0.502		O		O
56	59.410	95	0.506		T		T
58	59.340	100	0.510				
60	59.270	105	0.514		P		P
62	59.200	110	0.518		E		E
64	59.130	115	0.522		R		R
66	59.060	120	0.526		T		T
68	58.990	125	0.530		I		I
70	58.920	130	0.534		N		N
72	58.850	135	0.538		E		E
74	58.780	140	0.542		N		N
76	58.710	145	0.546		T		T
78	58.640	150	0.550				
80	58.570						
82	58.500						
84	58.430						
86	58.370						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	70	0.041	70	0.00098		N
	I	80	0.058	80	0.00134		O
	S	90	0.080	90	0.00182		T
	C	100	0.109	100	0.00244		
	I	110	0.148	110	0.00324		P
	B	120	0.198	120	0.00426		E
	L	130	0.262	130	0.00555		R
	E	140	0.344	140	0.00717		T
		150	0.447	150	0.00917		I
		160	0.577	160	0.01163		N
		170	0.738	170	0.01465		E
		180	0.937	180	0.01831		N
		190	1.181	190	0.02272		N
		200	1.478	200	0.02800		T
		210	1.837	210	0.03429		
		220	2.269	220	0.04173		
		230	2.785	230	0.05048		
		240	3.400	240	0.06073		
		250	4.126	250	0.07266		
		260	4.980	260	0.08650		
		270	5.981	270	0.10240		
		280	7.147	280	0.12080		
		290	8.500	290	0.14170		
		300	10.060	300	0.16560		
		310	11.860	310	0.19260		
		320	13.920	320	0.22320		

# DIETHYLENE GLYCOL MONOBUTYL ETHER

DME

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butoxydiethylene glycol Butoxydiglycol 2-(2-Butoxyethoxy) ethanol Butyl "carbitol" Diethylene glycol monoethyl ether Diglycol monobutyl ether Dowanol DB Poly-solv DB	Liquid  Colorless  Mild pleasant odor  Mixes with water.
<b>Fire</b> Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 40; Glycol ether  
2.2 Formula:  $C_4H_{10}OCH_2CH_2OCH_2CH_2OH$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 112-34-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety goggles or face shield.  
3.2 **Symptoms Following Exposure:** Inhalation for brief periods has no significant effect. Contact with liquid causes moderate irritation of eyes and corneal injury. Prolonged contact with skin causes only minor irritation.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; if ill effects are observed, call a doctor. EYES: immediately flush with plenty of water for at least 15 min. SKIN: wash well with soap and water. INGESTION: give large amounts of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $LD_{50} = 2 \text{ g/kg}$  (guinea pig)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 230°F O.C.  
172°F .C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, "alcohol" foam, carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 442°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 3.3 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 17.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 34% of theoretical in 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 162.2  
9.3 **Boiling Point at 1 atm:** 448°F = 231°C = 504°K  
9.4 **Freezing Point:** -90°F = -68°C = 205°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.954 at 20°C (liquid).  
9.8 **Liquid Surface Tension:** 34 dynes/cm = 0.034 N/m at 25°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 130 Btu/lb = 74 cal/g =  $3.1 \times 10^5 \text{ J/kg}$   
9.13 **Heat of Combustion:** (est.) -14,000 Btu/lb = -7,900 cal/g =  $-330 \times 10^5 \text{ J/kg}$   
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -36 Btu/lb = -20 cal/g =  $-0.84 \times 10^5 \text{ J/kg}$   
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIETHYLENE GLYCOL MONOBUTYL ETHER

DME

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	60.410	35	0.504	85	1.119	35	10.920
40	60.280	40	0.507	90	1.116	40	10.000
45	60.150	45	0.509	95	1.113	45	9.177
50	60.020	50	0.511	100	1.110	50	8.433
55	59.890	55	0.514	105	1.107	55	7.762
60	59.760	60	0.516	110	1.103	60	7.155
65	59.630	65	0.518	115	1.100	65	6.607
70	59.500	70	0.520	120	1.097	70	6.109
75	59.370	75	0.523	125	1.094	75	5.658
80	59.240	80	0.525	130	1.091	80	5.247
85	59.110	85	0.527	135	1.088	85	4.873
90	58.980	90	0.530	140	1.085	90	4.531
95	58.850	95	0.532	145	1.082	95	4.219
100	58.720	100	0.534	150	1.079	100	3.933
		105	0.537	155	1.076	105	3.672
		110	0.539	160	1.073	110	3.432
		115	0.541	165	1.070	115	3.211
		120	0.544	170	1.067	120	3.008
		125	0.546	175	1.064	125	2.821
		130	0.548	180	1.061	130	2.649
		135	0.550	185	1.058	135	2.489
		140	0.553			140	2.342
						145	2.206
						150	2.079
						155	1.962

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	220	0.159	220	0.00354		N
	I	230	0.207	230	0.00453		O
	S	240	0.266	240	0.00575		T
	C	250	0.341	250	0.00726		
	I	260	0.434	260	0.00910		P
	B	270	0.547	270	0.01134		E
	L	280	0.687	280	0.01404		R
	E	290	0.857	290	0.01727		T
		300	1.063	300	0.02114		I
		310	1.310	310	0.02572		N
		320	1.607	320	0.03115		E
		330	1.961	330	0.03752		N
		340	2.381	340	0.04499		T
		350	2.877	350	0.05369		
		360	3.460	360	0.06379		
		370	4.143	370	0.07546		
		380	4.940	380	0.08889		
		390	5.865	390	0.10430		
		400	6.936	400	0.12190		
		410	8.171	410	0.14200		
		420	9.591	420	0.16470		
		430	11.220	430	0.19050		
		440	13.070	440	0.21950		

# DIETHYLENE GLYCOL PHTHALATE

DGL

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid resin      Pale yellow

**Wear full impervious protective clothing and approved respirator.**  
**Shut off ignition sources and call fire department.**  
**Notify local health and pollution control agencies.**

### Fire

Combustible.  
Wear full protective clothing with self-contained breathing apparatus.  
Extinguish fire with dry chemical, alcohol foam, carbon dioxide.  
Use water spray to cool exposed containers.

### Exposure

CALL FOR MEDICAL AID.

**VAPOR**  
Move victim to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

**LIQUID**  
Remove contaminated clothing and shoes.  
Wash affected areas with soap and water.  
IF IN EYES, hold eyelids open and flush with plenty of water.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 34; Esters  
2.2 **Formula:** C<sub>8</sub>H<sub>8</sub>(COOC<sub>2</sub>H<sub>4</sub>OH)<sub>2</sub>  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** 629-38-9  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51385

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. **INHALATION:** Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. **EYES:** Flush with water for at least 15 min., lifting lids occasionally. **SKIN:** Remove contaminated clothing and shoes. Wash with soap and water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion**  
**Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Not pertinent.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 59.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 19.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
**Bioaccumulation:** 0  
**Damage to living resources:** 1  
**Human Oral hazard:** 0  
**Human Contact hazard:** 0  
**Reduction of amenities:** 0

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 254.23  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.29  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# DIETHYLENE GLYCOL PHTHALATE

DGL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DIETHYLENE GLYCOL MONOMETHYL ETHER

DGM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diethylene glycol methyl ether Dowanol DM 2-(2-Methoxyethoxy)-ethanol Methyl carbitol Poly-solv DM	Liquid	Colorless	Pleasant odor
Floats and mixes with water.			
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemical, water, or carbon dioxide. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to eyes. Harmful if swallowed. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ether
- 2.2 Formula:  $\text{CH}_3\text{OCH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{OH}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 111-77-3
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Safety goggles.
- 3.2 Symptoms Following Exposure: Liquid may irritate eyes.
- 3.3 Treatment of Exposure: SKIN OR EYES: Flush with water
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5$  to  $5$  g/kg (guinea pig)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: None
- 3.11 Liquid or Solid Characteristics: None
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 200°F O.C.
- 4.2 Flammable Limits in Air: LFL = 1.2%
- 4.3 Fire Extinguishing Agents: Water, carbon dioxide, or dry chemical
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 30.9 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 11.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): 34% of theoretical in 5 days
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 0
  - Human Oral hazard: 1
  - Human Contact hazard: I
  - Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open (flame arrester)
- 7.5 IMO Pollution Category: D
- 7.6 Ship Type: Data not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 120.15
- 9.3 Boiling Point at 1 atm: 381°F = 194°C = 467°K
- 9.4 Freezing Point: -120°F = -85°C = 188°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.025 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: 160 Btu/lb = 90 cal/g =  $3.8 \times 10^5$  J/kg
- 9.13 Heat of Combustion: -10,830 Btu/lb = -6020 cal/g =  $-252 \times 10^5$  J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: 0.01 psia

### NOTES



# DIETHYLENE GLYCOL MONOMETHYL ETHER

DGM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	64.540	85	0.518		N		N
54	64.469	90	0.521		O		O
56	64.400	95	0.524		T		T
58	64.330	100	0.527				
60	64.259	105	0.529		P		P
62	64.190	110	0.532		E		E
64	64.120	115	0.535		R		R
66	64.049	120	0.538		T		T
68	63.980	125	0.541		I		I
70	63.910	130	0.543		N		N
72	63.840	135	0.546		E		E
74	63.780	140	0.549		N		N
76	63.710	145	0.552		T		T
78	63.640	150	0.554				
80	63.570						
82	63.500						
84	63.430						
86	63.360						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	60	0.003	60	0.00006		N
	I	80	0.006	80	0.00013		O
	S	100	0.014	100	0.00027		T
	C	120	0.028	120	0.00054		
	I	140	0.055	140	0.00103		P
	B	160	0.103	160	0.00186		E
	L	180	0.186	180	0.00326		R
	E	200	0.324	200	0.00550		T
		220	0.545	220	0.00898		I
		240	0.892	240	0.01426		N
		260	1.418	260	0.02206		E
		280	2.200	280	0.03330		N
		300	3.335	300	0.04914		T
		320	4.949	320	0.07104		
		340	7.199	340	0.10080		
		360	10.280	360	0.14040		
		380	14.440	380	0.19250		

# DIETHYLENE GLYCOL METHYL ETHER ACETATE

DGR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methyl carbitol acetate		Liquid	Colorless
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Avoid contact with liquid and vapor.			
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Chemical and Physical Treatment: Absorb	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 34; Esters <b>2.2 Formula:</b> CH <sub>3</sub> COOC <sub>2</sub> H <sub>4</sub> OC <sub>2</sub> H <sub>4</sub> OC <sub>2</sub> H <sub>3</sub> <b>2.3 IMO/UN Designation:</b> Currently not available <b>2.4 DOT ID No.:</b> Not listed. <b>2.5 CAS Registry No.:</b> 629-38-9 <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 51616
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors. <b>3.2 Symptoms Following Exposure:</b> Exposure can cause irritation of eyes, nose and throat. <b>3.3 Treatment of Exposure:</b> Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Currently not available <b>3.8 Toxicity by Inhalation:</b> Currently not available <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 180°F O.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water.  
**4.5 Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Not listed.  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction.  
**5.2 Reactivity with Common Materials:** Currently not available  
**5.3 Stability During Transport:** Stable.  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent.  
**5.5 Polymerization:** Will not polymerize.  
**5.6 Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Technical grades.  
**7.2 Storage Temperature:** Ambient.  
**7.3 Inert Atmosphere:** No requirement.  
**7.4 Venting:** Not listed.  
**7.5 IMO Pollution Category:** D  
**7.6 Ship Type:** Data not available  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed.  
**8.2 49 CFR Class:** Not pertinent.  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 162.18  
**9.3 Boiling Point at 1 atm:** 408.4°F = 209.1°C = 482.1°K  
**9.4 Freezing Point:** Currently not available  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 1.04 @ 20°C  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** Currently not available  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Not pertinent.  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# DIETHYLENE GLYCOL METHYL ETHER ACETATE

DGR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	8.680		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DIMETHYL GLUTARATE

DGT

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless
<b>Keep people away.</b> <b>Call fire department.</b> <b>Avoid contact with liquid.</b> <b>Notify local health and pollution control agencies.</b>		
<b>Fire</b>	Combustible Water may be ineffective on fire. Wear self-contained breathing apparatus and protective clothing. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be irritating. Move to fresh air. If breathing has stopped give artificial respiration. If breathing is difficult give oxygen.  LIQUID May be harmful by ingestion or skin absorption. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters
- 2.2 Formula: CH<sub>3</sub>OOC(CH<sub>2</sub>)<sub>2</sub>COOCH<sub>3</sub>
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 1119-40-0
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion, or skin absorption. May cause irritation.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing give artificial respiration. If breathing is difficult give oxygen. EYES: Flush immediately with copious amounts of water for at least 15 minutes. SKIN: Wash immediately with soap and copious amounts of water for at least 15 minutes.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 218°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Will not occur
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 2
  - Human Oral hazard: 0
  - Human Contact hazard: 1
  - Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 160.17
- 9.3 **Boiling Point at 1 atm:** 199.4-203°F = 93-95°C = 366.2°K-368.2°K (at 13 mm Hg = .0171 atm)
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.087
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 5.52
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIMETHYL GLUTARATE

DGT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.237 0.246 0.255 0.264 0.273 0.282 0.290 0.299 0.307 0.316 0.324 0.332 0.340 0.347 0.355 0.363 0.370 0.377 0.385 0.392 0.399 0.405 0.412 0.418 0.425

# DIPROPYLENE GLYCOL DIBENZOATE

DGY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzoflex 9-88 Benzoflex 9-88 SG Benzoflex 9-98 Dibenzol dipropylene glycol ester Dipropenediol dibenzoate K-flex DP	Viscous liquid Straw color Faint aromatic
Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, CO <sub>2</sub> or water fog. Wear self-contained breathing apparatus and full protective clothing.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR, MIST AND LIQUID May irritate eyes, nose and throat. If inhaled, remove victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is conscious, have victim drink 2 glasses of water and induce vomiting.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 34; Esters  
2.2 **Formula:** [(C<sub>6</sub>H<sub>5</sub>)CO<sub>2</sub>CH<sub>2</sub>](C<sub>6</sub>H<sub>5</sub>)CH<sub>2</sub>O  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 94-51-9  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51616

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots, rubber gloves, and rubber apron. If spill is small, a full facepiece air purifying cartridge respirator equipped with organic vapor cartridge may be satisfactory.
- 3.2 **Symptoms Following Exposure:** May irritate eyes, nose, throat and mucous membrane. May cause coughing and chest discomfort. Prolonged exposure may cause skin irritation.
- 3.3 **Treatment of Exposure:** INHALATION: Get medical aid. Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: If victim is conscious, have victim drink 2 glasses of water and induce vomiting by sticking a finger down the throat. Do not give anything to an unconscious or convulsive person. EYES: Flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with lots of soap and water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2: LD<sub>50</sub> = 9.80 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Defatting of skin  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors or mists cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** >300°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, carbon dioxide, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** When heated to decomposition, it emits acrid smoke.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 109.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 31.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** >99%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 342.42  
9.3 **Boiling Point at 1 atm:** 446°F = 230°C = 503.2°K  
9.4 **Freezing Point:** -22°F = -30°C = 243.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.13  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 11.8  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# DIPROPYLENE GLYCOL DIBENZOATE

DGY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	68	0.019		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.238 0.249 0.261 0.272 0.282 0.293 0.303 0.314 0.324 0.334 0.343 0.353 0.362 0.371 0.380 0.389 0.397 0.406 0.414 0.422 0.430 0.427 0.445 0.452 0.460

# DI-N-HEXYL ADIPATE

DHA

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless
	Floats on water.	
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.		
Fire	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.	
Exposure	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Clean shore line	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 34; Esters <b>2.2 Formula:</b> $(-CH_2CH_2COOC_6H_{13})_2$ <b>2.3 IMO/UN Designation:</b> Currently not available <b>2.4 DOT ID No.:</b> Not listed. <b>2.5 CAS Registry No.:</b> Currently not available <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 51385
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors. <b>3.2 Symptoms Following Exposure:</b> Exposure can cause irritation of eyes, nose and throat. <b>3.3 Treatment of Exposure:</b> Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Currently not available <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 325°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water.  
**4.5 Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.8 Electrical Hazards:** Not listed.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 116.6 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 35.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction.  
**5.2 Reactivity with Common Materials:** Currently not available  
**5.3 Stability During Transport:** Stable.  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent.  
**5.5 Polymerization:** Will not polymerize.  
**5.6 Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Technical grades.  
**7.2 Storage Temperature:** Ambient.  
**7.3 Inert Atmosphere:** No requirement.  
**7.4 Venting:** Open.  
**7.5 IMO Pollution Category:** B  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed.  
**8.2 49 CFR Class:** Not pertinent.  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 155.07  
**9.3 Boiling Point at 1 atm:** Currently not available  
**9.4 Freezing Point:** Currently not available  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 0.939 @ 20°C  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** Currently not available  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Not pertinent.  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES



# DI-N-HEXYL ADIPATE

DHA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	7.840		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DIETHYLENE GLYCOL N-HEXYL ETHER

DHE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hexyl carbitol		Liquid	Water white
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_5\text{OC}_2\text{H}_4\text{OC}_2\text{H}_4\text{OH}$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 112-59-4  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 4.92 \text{ g/kg (rat)}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 285°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 66.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 21.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 190.32  
9.3 **Boiling Point at 1 atm:** 498.4°F = 259.1°C = 532.1 °K  
9.4 **Freezing Point:** -27.4°F = -33°C = 240°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.9346 @ 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIETHYLENE GLYCOL N-HEXYL ETHER

DHE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	7.800		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DECAHYDRONAPHTHALENE

DHN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bicyclo[4.4.0]Decane DEC Decalin DE Kalin Naphthane Naphthalene Perhydronaphthalene	Liquid  Colorless  Turpentine-like odor  Floats on water.
<b>Keep people away. Avoid contact with liquid and vapor. Call fire department. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. If swallowed will cause headache, nausea, or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{10}H_{18}$   
2.3 IMO/UN Designation: 3.3/1147  
2.4 DOT ID No.: 1147  
2.5 CAS Registry No.: 91-17-8  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air mask or self-contained breathing apparatus if in enclosed tank; rubber gloves or protective cream; goggles or face shield.
- 3.2 **Symptoms Following Exposure:** Inhalation or ingestion irritates nose and throat, causes numbness, headache, vomiting; urine may become blue. Irritates eyes. Liquid de-fats skin and causes cracking and secondary infection; eczema may develop.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air. EYES: flush with water for at least 15 min. SKIN: wash with water and mild soap. INGESTION: give emetic such as warm salt water, followed by a mild cathartic; direct physician to conserve liver and kidney function.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $LD_{50} = 4,170$  mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 134°F O.C.  
4.2 **Flammable Limits in Air:** 0.7%-5.4%  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 482°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 5.9 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 69.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 19.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: mixture of cis-(35%) and trans-(65%) isomers. Properties of all such mixtures are very similar. Spectro grade.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 138.2  
9.3 **Boiling Point at 1 atm:** 383°F = 195°C = 468°K  
9.4 **Freezing Point:** -44°F = -42°C = 231°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.89 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 30 dynes/cm = 0.030 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 51.5 dynes/cm = 0.0515 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 130 Btu/lb = 71 cal/g =  $3.0 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -19,200 Btu/lb = -10,700 cal/g = -447  $\times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DECAHYDRONAPHTHALENE

DHN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	56.000	55	0.380	135	0.735	52	2.165
54	55.940	60	0.384	140	0.735	54	2.119
56	55.890	65	0.387	145	0.735	56	2.073
58	55.830	70	0.391	150	0.735	58	2.029
60	55.780	75	0.394	155	0.735	60	1.986
62	55.720	80	0.398	160	0.735	62	1.944
64	55.670	85	0.401	165	0.735	64	1.903
66	55.610	90	0.405	170	0.735	66	1.864
68	55.560	95	0.408	175	0.735	68	1.826
70	55.500	100	0.412	180	0.735	70	1.788
72	55.440	105	0.415	185	0.735	72	1.752
74	55.390	110	0.419	190	0.735	74	1.717
76	55.330	115	0.422	195	0.735	76	1.683
78	55.280	120	0.426	200	0.735	78	1.649
80	55.220	125	0.430	205	0.735	80	1.617
82	55.170			210	0.735	82	1.585
84	55.110			215	0.735	84	1.555
86	55.060			220	0.735	86	1.525

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	130	0.123	130	0.00269		N
	N	140	0.160	140	0.00345		O
	S	150	0.207	150	0.00438		T
	O	160	0.266	160	0.00553		P
	L	170	0.338	170	0.00692		E
	U	180	0.427	180	0.00860		R
	B	190	0.536	190	0.01062		T
	I	200	0.667	200	0.01302		I
	E	210	0.825	210	0.01586		N
		220	1.014	220	0.01921		E
		230	1.239	230	0.02313		N
		240	1.505	240	0.02769		T
		250	1.818	250	0.03299		
		260	2.185	260	0.03910		
		270	2.613	270	0.04611		
		280	3.110	280	0.05413		
		290	3.684	290	0.06327		
		300	4.344	300	0.07363		
		310	5.101	310	0.08533		
		320	5.965	320	0.09850		
		330	6.948	330	0.11330		
		340	8.062	340	0.12980		
		350	9.320	350	0.14820		
		360	10.740	360	0.16860		
		370	12.330	370	0.19130		
		380	14.110	380	0.21630		

# DIHEPTYL PHTHALATE

DHP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Phthalic acid, diheptyl ester	Liquid White Odorless
May float or sink in water.	
Keep people away. Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge.  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula:  $C_{18}H_{34}O_4$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 3648-21-3  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Inhalation of vapors from very hot material may cause headache, drowsiness, and convulsions. Contact with eyes may cause irritation.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. EYES: flush with water. SKIN: wipe off; flush with water; wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 135.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 39.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May attack some forms of plastics.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Pure  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 362  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) 1.0 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** (est.) -16,850 Btu/lb = -9,370 cal/g = -392 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIHEPTYL PHTHALATE

DHP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	62.420		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 1,6-DICHLOROHEXANE

DHX

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless
<b>Wear full impervious protective clothing and approved respirator.</b> Avoid contact with liquid and vapor. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Chemical and Physical Treatment:  
Neutralize  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{ClH}_2\text{C}(\text{C}_4\text{H}_9)\text{CH}_2\text{Cl}$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 2163-00-0  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51138

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 165°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as hydrogen chloride and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: Z  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%; technical grades.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 155.07  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.068 @ 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# 1,6-DICHLOROHEXANE

DHX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	8.910		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DIISOPROPYLAMINE

DIA

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid                      Colorless                      Fishy odor

Floats and mixes with water.

Evacuate.  
Shut off ignition sources. Call fire department.  
**KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID.**  
Stay upwind. Use water spray to "knock down" vapor.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

FLAMMABLE.  
POISONOUS GASES MAY BE PRODUCED IN FIRE.  
Containers may explode in fire.  
Flashback along vapor trail may occur.  
Vapor may explode if ignited in an enclosed area.  
Wear goggles and self-contained breathing apparatus.  
Extinguish with dry chemicals, alcohol foam, or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.  
  
VAPOR  
Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.  
  
LIQUID  
Will burn eyes.  
Irritating to eyes.  
If swallowed will cause nausea and vomiting.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amine  
2.2 Formula:  $[(CH_3)_2CH]_2NH$  or  $C_6H_{15}N$   
2.3 IMO/UN Designation: 3.2/1158  
2.4 DOT ID No.: 1158  
2.5 CAS Registry No.: 108-18-9  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51451

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask; plastic gloves; monogoggles; rubber apron  
3.2 **Symptoms Following Exposure:** Inhalation of vapors causes irritation, sometimes with nausea and vomiting; can also cause burns to the respiratory system. Ingestion causes irritation of mouth and stomach. Vapor irritates eyes; liquid causes severe burn, like caustic. Contact with skin causes irritation.  
3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air and keep him quiet and comfortably warm; give oxygen if breathing is difficult; call a physician. INGESTION: induce vomiting by giving a large volume of warm salt water; consult a physician. EYES: immediately flush eyes with plenty of water for at least 15 min., then get medical care. SKIN: flush with water; remove contaminated clothing and wash skin; if there is any redness or evidence of burning, consult a physician.  
3.4 TLV-TWA: 5 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; oral  $LD_{50} = 0.7$  g/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 Liquid or Solid Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 200 ppm  
3.14 OSHA PEL-TWA: 5 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: 20°F O.C. 35°F C.C.  
4.2 Flammable Limits in Air: 0.8%-7.1%  
4.3 Fire Extinguishing Agents: "Alcohol" foam, dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fires.  
4.6 Behavior in Fire: Vapor is heavier than air and may travel to a source of ignition and flash back.  
4.7 Auto Ignition Temperature: 600°F  
4.8 Electrical Hazards: Class I  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 51.2 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 14.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: May attack some forms of plastics  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
60 ppm/24 hr/creek chub/lethal/fresh water  
40-60 ppm"/creek chub/"critical range"/fresh water  
\*Time period not specified.  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: commercial, 100%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: C  
7.6 Ship Type: 2  
7.7 Barge Hull Type: 2

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 101.19  
9.3 Boiling Point at 1 atm: 183.0°F = 83.9°C = 357.1°K  
9.4 Freezing Point: -141.3°F = -96.3°C = 176.9°K  
9.5 Critical Temperature: 480.2°F = 249.0°C = 522.2°K  
9.6 Critical Pressure: (est.) 400 psia = 30 atm = 3 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.717 at 20°C (liquid)  
9.8 Liquid Surface Tension: 19.64 dynes/cm = 0.01964 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 3.5  
9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.064  
9.12 Latent Heat of Vaporization: 121 Btu/lb = 67.5 cal/g =  $2.82 \times 10^5$  J/kg  
9.13 Heat of Combustion: -19,800 Btu/lb = -11,000 cal/g =  $-460 \times 10^5$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: -140 Btu/lb = -76 cal/g =  $3.2 \times 10^5$  J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 2.5 psia

## NOTES

# DIISOPROPYLAMINE

DIA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
51	45.170	67	0.631	67	0.811	-50	1.134
52	45.150					-40	1.019
53	45.120					-30	0.920
54	45.100					-20	0.834
55	45.070					-10	0.760
56	45.050					0	0.695
57	45.020					10	0.639
58	45.000					20	0.588
59	44.980					30	0.544
60	44.950					40	0.505
61	44.930					50	0.469
62	44.900					60	0.438
63	44.880					70	0.410
64	44.850					80	0.384
65	44.830					90	0.361
66	44.810					100	0.340
67	44.780					110	0.321
68	44.760					120	0.304
69	44.730					130	0.288
70	44.710					140	0.273
71	44.680						
72	44.660						
73	44.640						
74	44.610						
75	44.590						
76	44.560						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		70	1.222	70	0.02175	50	0.356
		75	1.394	75	0.02458	100	0.388
		80	1.587	80	0.02772	150	0.420
		85	1.802	85	0.03118	200	0.450
		90	2.041	90	0.03501	250	0.479
		95	2.307	95	0.03921	300	0.507
		100	2.602	100	0.04383	350	0.534
		105	2.928	105	0.04889	400	0.559
		110	3.289	110	0.05442	450	0.584
		115	3.686	115	0.06046	500	0.607
		120	4.123	120	0.06705	550	0.630
		125	4.603	125	0.07422	600	0.651
		130	5.130	130	0.08201	650	0.672
		135	5.706	135	0.09046	700	0.691
		140	6.336	140	0.09960	750	0.710
		145	7.023	145	0.10950	800	0.728
		150	7.772	150	0.12020	850	0.745
		155	8.586	155	0.13170	900	0.761
		160	9.470	160	0.14410	950	0.777
		165	10.430	165	0.15740	1000	0.791
		170	11.470	170	0.17170	1050	0.805
		175	12.590	175	0.18700	1100	0.819
		180	13.800	180	0.20340	1150	0.831
		185	15.110	185	0.22100		

# DICHLOBENIL

DIB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Casoron 2,6-DBN 2,6-Dichlorobenzonitrile Du-sprex NIA 5996	Solid crystalline      White      Aromatic odor  Mixes slowly with water.
Keep people away. Wear goggles, self-contained breathing apparatus, protective clothing, and rubber gloves. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and induce vomiting. Flush affected areas with plenty of water.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>7</sub>H<sub>4</sub>Cl<sub>2</sub>N  
2.3 IMO/UN Designation: 6.1/1609(>10%); 9/1609 (<10%)  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 1194-65-6  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51484

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Use dust respirator, rubber gloves, goggles, paper suit, hand barrier cream.  
3.2 **Symptoms Following Exposure:** INHALATION: No human overexposures known. INGESTION: Most prominent symptoms in laboratory animals 4 hours after exposure are inactivity, anorexia, and sedation.  
3.3 **Treatment of Exposure:** Call a physician. EYES: Flush with water. SKIN: Wash with water. INGESTION: Gastric lavage and symptomatic therapy.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** At 50 ppm growth inhibition occurred in second generation rats and at higher levels hypertrophy of liver and kidneys was found.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** All media are applicable.  
4.4 **Fire Extinguishing Agents Not to Be Used:** None  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not flammable  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
Suspension. Does not deteriorate.  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Wettable powder  
17 to 22 ppm/24-hour/Bluegill/LC<sub>50</sub>  
23 ppm/24-hour/Rainbow trout/LC<sub>50</sub>  
Granular  
37 ppm/24-hour/Bluegill/LC<sub>50</sub>  
20 ppm/48-hour/Bluegill/LC<sub>50</sub>  
120 ppm/24-hour/Harlequin fish/LC<sub>50</sub>  
6.2 **Waterfowl Toxicity:** Young mallards LD<sub>50</sub> = >2000 mg/kg  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Accumulated by goldfish at a 15 to 20 fold level in 3 months.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Cool  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not listed.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 172  
9.3 **Boiling Point at 1 atm:** 518°F = 270°C = 543.2°K  
9.4 **Freezing Point:** 293 to 294.8°F = 145 to 146°C = 418.2 to 419.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Thermally extremely stable  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DICHLLOBENIL

DIB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.002	220	0.405	220	0.01531		C
69	0.002	240	1.364	240	0.04800		U
70	0.002	260	2.323	260	0.07567		R
71	0.002	280	3.282	280	0.09938		R
72	0.002	300	4.241	300	0.11993		E
73	0.002	320	5.201	320	0.13791		N
74	0.002	340	6.160	340	0.15377		T
75	0.002	360	7.119	360	0.16787		L
76	0.002	380	8.078	380	0.18049		Y
77	0.002	400	9.037	400	0.19185		
		420	9.996	420	0.20212		N
		440	10.955	440	0.21146		O
		460	11.915	460	0.21999		T
		480	12.874	480	0.22781		
		500	13.833	500	0.23500		A
							V
							A
							I
							L
							A
							B
							L
							E

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Banvel D 3,6-Dichloro-o-anisic acid Mediben	Solid, crystalline      White or brown      Odorless  Mixes slowly with water.
Keep people away. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_8H_6Cl_2O_3$   
2.3 IMO/UN Designation: 6.1/1609 (>10%); 9/1609 (<10%)  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 1918-00-9  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51394

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Currently not available  
3.2 Symptoms Following Exposure: EYES: Low-grade irritation produced by undiluted material. SKIN: Undiluted - very mild irritation when continued for 2 weeks. Diluted 1:40 in H<sub>2</sub>O - no irritation after 30 days.  
3.3 Treatment of Exposure: EYES: Flush with water; obtain medical attention. SKIN: Wash with ample water. INGESTION: Induce vomiting.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg.  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Two-year feeding of 500 ppm to rats and dogs - no observable effects.  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to skin.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Currently not available  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Not flammable  
4.8 Electrical Hazards: Not flammable  
4.9 Burning Rate: Not flammable  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Currently not available  
5.5 Polymerization: Currently not available  
5.6 Inhibitor of Polymerization: Currently not available

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
40 ppm/48-hour TL<sub>m</sub>/Bluegill  
35 ppm/48-hour TL<sub>m</sub>/Rainbow trout  
> 100 ppm/48-hour TL<sub>m</sub>/Six freshwater crustaceans  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Did not magnify in food chain organisms.  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 221  
9.3 Boiling Point at 1 atm: Currently not available  
9.4 Freezing Point: 237.2° to 240.8°F = 114° to 116°C = 387.2° to 389.2°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: Currently not available  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 7.62  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.450		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# DIISODECYL PHTHALATE

DID

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Phthalic acid, diisodecyl ester Phthalic acid, bis (8-methyl-nonyl) ester Plasticized DDP		Liquid	Colorless
		May float or sink in water.	
Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.		
<b>Exposure</b>	LIQUID Not harmful.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Collection Systems: Skim Chemical and Physical Treatment: Absorb Clean shore line	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 34; Ester 2.2 Formula: C <sub>28</sub> H <sub>56</sub> O <sub>4</sub> 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 26761-40-0 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51385
<b>3. HEALTH HAZARDS</b> 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves 3.2 Symptoms Following Exposure: No symptoms reported for any rate of exposure. 3.3 Treatment of Exposure: INGESTION: call physician. EYES: flush with water; call physician. SKIN: wipe off; wash with soap and water. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Currently not available 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 450°F O.C.  
4.2 Flammable Limits in Air: LFL 0.2% at 508°F  
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 755°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 178.5 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 51.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: May attack some forms of plastics  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 446.7  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: -58°F = -50°C = 223°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.967 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: (est.) -16,600 Btu/lb = -9,220 cal/g = -386 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

NOTES



# DIISODECYL PHTHALATE

DID

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	60.360		N O T  P E R T I N E N T		N O T  P E R T I N E N T	34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76	569.099 514.899 466.299 422.599 383.199 347.799 316.000 287.199 261.299 237.900 216.699 197.599 180.299 164.599 150.400 137.500 125.799 115.200 105.500 96.730 88.730 81.450

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DI-(2-ETHYLHEXYL) PHTHALATE

DIE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> DEHP Di-sec-octyl phthalate Bis-(2-Ethylhexyl)phthalate Phthalic acid, bis-(2-ethylhexyl ester)	Oily liquid  Colorless  Odorless  Floats on water.
Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Toxic vapors and gases may be released in fire. Wear self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with dry chemical, alcohol foam, or carbon dioxide.
<b>Exposure</b>	Call for medical aid. Move to fresh air. Remove contaminated clothing and shoes. Wash affected areas with plenty of soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $C_{24}H_{38}O_4$   
2.3 IMO/UN Designation: Not listed.  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 117-81-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical protective clothing, gloves, and other appropriate protective clothing to prevent skin contact. Contact lenses should not be worn when working with this material. Use self-contained breathing apparatus if vapor concentrations are present.
- 3.2 **Symptoms Following Exposure:** Exposure can cause gastric disturbances and diarrhea. Skin sensitization and irritation of the eyes, skin and respiratory tract can also occur.
- 3.3 **Treatment of Exposure:** Call for medical aid. INHALATION: Move to fresh air. EYES: Flush with plenty of water for at least 15 mins., lifting lids occasionally. SKIN: Wash immediately with soap and water. INGESTION: Give 1-2 glasses of water or milk, then induce vomiting.
- 3.4 TLV-TWA: 5 mg/m<sup>3</sup>  
3.5 TLV-STEL: 10 mg/m<sup>3</sup>  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 **Chronic Toxicity:** Subchronic inhalation by rats or mice caused pulmonary irritation, congestion of liver and kidneys, renal cysts, bladder stones, and increased liver metabolism. Chronic inhalation by mice or rats caused liver cancer.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: 5,000 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 5 mg/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 425°F O.C.  
4.2 Flammable Limits in Air: LEL: 0.3% @ 474°F.  
4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, or alcohol foam.  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion  
Products: Toxic vapors and gases, such as carbon monoxide, may be released in a fire.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 735°F.  
4.8 Electrical Hazards: Not listed.  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 149.9 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 43.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.  
5.2 Reactivity with Common Materials: Incompatible with nitrates, strong oxidizers, strong alkalis, or strong acids. Reactions with these compounds may cause fires and explosions.  
5.3 Stability During Transport: Stable.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.  
5.5 Polymerization: Will not polymerize.  
5.6 Inhibitor of Polymerization: Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None.  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99%; Technical grades.  
7.2 Storage Temperature: Ambient.  
7.3 Inert Atmosphere: No requirement.  
7.4 Venting: Not listed.  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.  
8.2 49 CFR Class: Not pertinent.  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: U028  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 390.6  
9.3 Boiling Point at 1 atm: 727°F = 386°C = 659°K  
9.4 Freezing Point: -58°F = -50°C = 223°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 0.9861  
9.8 Liquid Surface Tension: (est.) 15 dynes/cm = 0.015 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 30 dynes/cm = 0.03 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: 16  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent.  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# DI-(2-ETHYLHEXYL) PHTHALATE

DIE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.005	68 392	0.000 0.026	68 392	0.00001 0.00109		C U R R E N T L Y  N O T  A V A I L A B L E

# DINONYL PHTHALATE

DIF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bioflex 91 Dinonyl 1,2-benzenedicarboxylate Di-n-nonyl phthalate Phthalic acid, dinonyl ester	Liquid	Colorless	Odorless
Keep people away. Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Water may be ineffective on fire. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> .		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Remove contaminated clothing and shoes. Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink 1-2 glasses of water.		
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula: (C<sub>8</sub>H<sub>9</sub>)(COOC<sub>8</sub>H<sub>9</sub>)<sub>2</sub>  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 84-76-4  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Moderately toxic by ingestion.  
3.3 **Treatment of Exposure:** INHALATION: Move to fresh air. INGESTION: Have victim drink 1-2 glasses of water. EYES: Flush with water. SKIN: Wipe off. Flush with water. Wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 2.0 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 420°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 164.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 47.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** May attack some form of plastics.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Not pertinent.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid.  
9.2 **Molecular Weight:** 418.68  
9.3 **Boiling Point at 1 atm:** 775°F = 413°C = 686.2°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** .97  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 14.44  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DINONYL PHTHALATE

DIF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	401	0.019		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.297 0.310 0.323 0.336 0.348 0.360 0.372 0.384 0.395 0.406 0.417 0.428 0.439 0.449 0.460 0.470 0.480 0.489 0.499 0.508 0.517 0.526 0.535 0.544 0.552

# DIETHYLENE GLYCOL DIBUTYL ETHER

DIG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bis(2-Butoxyethyl) ether Butyl diglyme 2,2'-Dibutoxyethyl ether Dibutyl carbitol Diethylene glycol di-n-butyl ether 5,8,11-Trioxapentadecane	Liquid  Colorless  Floats on water.
<b>Keep people away. Call fire department. Evacuate area. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. Flash back along vapor trail may occur. Water may be ineffective on fire. Extinguish with water spray, dry chemical, alcohol foam, or CO <sub>2</sub> .
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Vapor irritating to eyes, nose and throat. Move victim to fresh air.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ethers  
2.2 Formula:  $[\text{CH}_2(\text{CH}_2)_4\text{OCH}_2\text{CH}_2]_2\text{O}$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 112-73-2  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.  
3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion and skin absorption. Causes eye and skin irritation. Material is irritating to mucous membrane and upper respiratory tract.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. If not breathing give artificial respiration. If breathing is difficult give oxygen. SKIN: Wash with soap and copious amounts of water. EYES: Flush with copious amounts of water for at least 15 minutes.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 3.9 g/kg rat  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of skin and first degree burn on short exposure; may cause second degree burn on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 118°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Vapor may travel considerable distance to a source of ignition and flash back.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 80.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 25.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Will not occur  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Nitrogen atmosphere  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 218.34  
9.3 **Boiling Point at 1 atm:** 492.8°F = 256°C = 529.2°K  
9.4 **Freezing Point:** -76°F = -60°C = 213.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.885  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** >1  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIETHYLENE GLYCOL DIBUTYL ETHER

DIG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	68	0.000		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.327 0.340 0.352 0.364 0.376 0.388 0.399 0.410 0.422 0.433 0.443 0.454 0.464 0.475 0.485 0.495 0.505 0.514 0.524 0.533 0.542 0.551 0.560 0.568 0.577

# DIISOPROPYLBENZENE HYDROPEROXIDE

DIH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isopropylcumyl hydroperoxide		Liquid	Colorless to pale yellow	Sharp, unpleasant odor
		May float or sink in water.		
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b>				
<b>Fire</b>	Combustible. Will increase the intensity of a fire. May cause fire on contact with combustibles. Containers may explode in fire. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** (CH<sub>3</sub>)<sub>2</sub>CHC<sub>6</sub>H<sub>4</sub>C(CH<sub>3</sub>)<sub>2</sub>OOH  
+(CH<sub>3</sub>)<sub>2</sub>CHC<sub>6</sub>H<sub>4</sub>CH(CH<sub>3</sub>)<sub>2</sub>  
2.3 **IMO/UN Designation:** 5.2/1875  
2.4 **DOT ID No.:** Forbidden  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 145  
2.7 **Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** solvent-resistant gloves; chemical-resistant apron; chemical goggles or face shield; self-contained breathing apparatus  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with eyes or skin causes throbbing sensation and irritation.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air; call a doctor. EYES: flush with water for 15 min., holding eyelids open; call physician. SKIN: wash several times with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 175°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Flammable alcohol and ketone gases are formed in fire.  
4.6 **Behavior in Fire:** Burns with a flare effect. Containers may explode.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Aluminum, copper, brass, lead, zinc salts, mineral acids, oxidizing or reducing agents all can cause rapid decomposition.  
5.3 **Stability During Transport:** Unstable; slowly evolves oxygen  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 54.06%, the balance being diisopropylbenzene, a combustible hydrocarbon  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Forbidden  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not pertinent  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 194.26  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** <15°F = <-9°C = <264°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.956 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# DIISOPROPYLBENZENE HYDROPEROXIDE

DIH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
51	59.950		N O T		N O T		N O T
52	59.920						
53	59.880						
54	59.850						
55	59.810		P		P		P
56	59.780		E		E		E
57	59.740		R		R		R
58	59.710		T		T		T
59	59.680		I		I		I
60	59.640		N		N		N
61	59.610		E		E		E
62	59.570		N		N		N
63	59.540		T		T		T
64	59.500						
65	59.470						
66	59.430						
67	59.400						
68	59.360						
69	59.330						
70	59.290						
71	59.260						
72	59.220						
73	59.190						
74	59.160						
75	59.120						
76	59.090						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DIISOPROPYL NAPHTHALENE

DII

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,6-Diisopropyl naphthalene		Liquid	Clear yellowish brown	Faint, sweet odor
Avoid inhalation of vapors or prolonged skin contact. Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.				
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 32; Aromatic hydrocarbons  
**2.2 Formula:** (CH<sub>3</sub>)<sub>2</sub>CH(C<sub>10</sub>H<sub>7</sub>)CH(CH<sub>3</sub>)<sub>2</sub>  
**2.3 IMO/UN Designation:** Currently not available  
**2.4 DOT ID No.:** Not listed.  
**2.5 CAS Registry No.:** 24157-81-1  
**2.6 NAERG Guide No.:** Not listed  
**2.7 Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.
- 3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Currently not available  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 284°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water.  
**4.5 Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Not listed.  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 102.3 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 27.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction.  
**5.2 Reactivity with Common Materials:** Currently not available  
**5.3 Stability During Transport:** Stable.  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent.  
**5.5 Polymerization:** Will not polymerize.  
**5.6 Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Technical grades.  
**7.2 Storage Temperature:** Ambient.  
**7.3 Inert Atmosphere:** No requirement.  
**7.4 Venting:** Not listed.  
**7.5 IMO Pollution Category:** D  
**7.6 Ship Type:** Data not available  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed.  
**8.2 49 CFR Class:** Not pertinent.  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** Yes  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 212.34  
**9.3 Boiling Point at 1 atm:** 554 - 563°F = 290 - 295°C = 302 - 307°K  
**9.4 Freezing Point:** Currently not available  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 0.95 at 30°C  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** Currently not available  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Not pertinent.  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# DIISOPROPYL NAPHTHALENE

DII

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
86	7.930		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DIISOBUTYL KETONE

DIK

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> DIBK 5-Diisopropylacetone 2,6-Dimethyl-4-heptane Isovalerone	Liquid  Colorless  Mild, sweet odor  Floats on water.
<b>Keep people away.</b> <b>Avoid contact with liquid and vapor.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 18; Ketone  
2.2 Formula:  $(CH_3)_2CHCH_2COCH_2CH(CH_3)_2$  or  $C_9H_{18}O$   
2.3 IMO/UN Designation: 3.3/1157  
2.4 DOT ID No.: 1157  
2.5 CAS Registry No.: 108-83-8  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask in confined areas; plastic gloves; face shield and safety glasses
- 3.2 **Symptoms Following Exposure:** Inhalation of vapor causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Vapor irritates eyes. Contact with liquid irritates skin.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air; give oxygen if breathing is difficult; call a physician. EYES: flush with plenty of water. SKIN: wipe off; flush with plenty of water; wash with soap and water.
- 3.4 **TLV-TWA:** 25 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral  $LD_{50}$  = 1.4 g/kg (mouse), 5.75 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes increased liver and kidney weights in rats, decreased liver weights in guinea pigs
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 500 ppm
- 3.14 **OSHA PEL-TWA:** 50 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 131°F O.C. 120°F C.C.
- 4.2 **Flammable Limits in Air:** 0.81%-7.1% at 200°F
- 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** 745°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 61.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** May attack some forms of plastics.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 65 ppm/24 hr/brine shrimp/TL<sub>m</sub>
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 4% of theoretical in 5 days, fresh water
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 142.23
- 9.3 **Boiling Point at 1 atm:** 325°F = 163°C = 436°K
- 9.4 **Freezing Point:** -43°F = -42°C = 231°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.806 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 23.92 dynes/cm = 0.02392 N/m at 22°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 4.9
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** 121 Btu/lb = 67 cal/g =  $2.8 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** -16,040 Btu/lb = -8,910 cal/g =  $-373 \times 10^5$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.21 psia

### NOTES

# DIISOBUTYL KETONE

DIK

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	52.200	N O T		60	1.048	35	1.274
36	52.090			61	1.048	40	1.208
38	51.980			62	1.048	45	1.146
40	51.870			63	1.048	50	1.089
42	51.750	P E R T I N E N T		64	1.048	55	1.035
44	51.640			65	1.048	60	0.986
46	51.530			66	1.048	65	0.939
48	51.420			67	1.048	70	0.896
50	51.310			68	1.048	75	0.855
52	51.200			69	1.048	80	0.817
54	51.090			70	1.048	85	0.781
56	50.980			71	1.048	90	0.747
58	50.870			72	1.048	95	0.716
60	50.760			73	1.048	100	0.686
62	50.650			74	1.048		
64	50.530			75	1.048		
66	50.420			76	1.048		
68	50.310			77	1.048		
70	50.200						
72	50.090						
74	49.980						
76	49.870						
78	49.760						
80	49.650						
82	49.540						
84	49.420						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.050	70	0.035	70	0.00088	N O T	
		80	0.050	80	0.00122		
		90	0.069	90	0.00167		
		100	0.095	100	0.00225		
		110	0.130	110	0.00301	P E R T I N E N T	
		120	0.174	120	0.00399		
		130	0.232	130	0.00522		
		140	0.307	140	0.00678		
		150	0.402	150	0.00873		
		160	0.521	160	0.01114		
		170	0.670	170	0.01410		
		180	0.855	180	0.01771		
		190	1.083	190	0.02209		
		200	1.362	200	0.02736		
		210	1.701	210	0.03366		
		220	2.111	220	0.04115		
		230	2.603	230	0.05001		
		240	3.191	240	0.06042		
		250	3.888	250	0.07260		
		260	4.713	260	0.08677		
		270	5.682	270	0.10320		
		280	6.817	280	0.12210		
		290	8.137	290	0.14380		
		300	9.669	300	0.16860		
		310	11.440	310	0.19690		
		320	13.470	320	0.22890		

# DIPHENYL

DIL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bibenzene Biphenyl 1,1'-Biphenyl Carolid AL Lemonene Phenador-X Phenylbenzene PPPH Tetrosin LY Xenene	Solid	Colorless to pale yellow	Characteristic aromatic odor
<b>Keep people away. Call fire department. Avoid contact with liquid and solid. Notify local health and pollution control agencies. Protect water intakes.</b>			
<b>Fire</b>	Combustible Wear self-contained breathing apparatus and protective clothing. Extinguish with water, dry chemical, alcohol foam or CO <sub>2</sub> . Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR, MIST OR DUST. Irritating to eyes, nose, throat and skin. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.  SOLID OR LIQUID Irritating to skin and eyes, nose and throat. Remove contaminated clothing and shoes. Flush affected areas with plenty water. IF IN EYES, hold eyelids open and flush with plenty of water. If swallowed, do not induce vomiting.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 32; Aromatic Hydrocarbon  
2.2 **Formula:** C<sub>12</sub>H<sub>10</sub>  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 92-52-4  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus and protective equipment.  
3.2 **Symptoms Following Exposure:** Harmful if inhaled or swallowed. Causes irritation to eyes, skin and mucous membrane and upper respiratory tract. Causes central nervous system depression, paralysis and convulsion in animals. May cause headache, diffuse gastrointestinal pain, nausea, indigestion, numbness and aching of limbs, and general fatigue. Liver function test may show abnormalities. Chronic exposure is mostly characterized by central nervous system symptoms, fatigue, headache, tremor, insomnia, sensory impairment, and mood changes. Such symptoms are rare however.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing give artificial respiration. If breathing is difficult give oxygen. INGESTION: DO NOT INDUCE VOMITING. SKIN: Wash with soap and copious amounts of water. EYES: Flush with copious amounts of water for at least 15 minutes.  
3.4 **TLV-TWA:** 0.2 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 1.9 g/kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May cause nervous system disturbance and damage to liver.  
3.10 **Vapor (Gas) Irritant Characteristics:** VAPORS cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 100 mg/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 0.2 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 235°F C.C.  
4.2 **Flammable Limits in Air:** 0.6% @ 111°C to 5.8% @ 166°C  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam, water spray.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Emits toxic fumes under fire conditions.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 1004°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 69.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 17.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Cautics:** Not pertinent  
5.5 **Polymerization:** Will not occur  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 1  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 154.21  
9.3 **Boiling Point at 1 atm:** 491°F = 255°C = 528.2°K  
9.4 **Freezing Point:** 156-161.6°F = 69-72°C = 342.2-345.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.992  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 5.31  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** <0.001 psia

### NOTES

# DIPHENYL

DIL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	159 215 243 274 307 329 357 400 445 491	0.019 0.097 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.201 0.215 0.229 0.242 0.256 0.269 0.282 0.294 0.306 0.319 0.330 0.342 0.353 0.364 0.375 0.386 0.396 0.407 0.417 0.427 0.436 0.446 0.455 0.464 0.473

# DIMETHYL ETHER

DIM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methyl ether Wood ether	Liquefied gas	Colorless	Pleasant odor
Floats and boils on water. Flammable, irritating vapor is produced.			
Keep people away. Shut off ignition sources. Call fire department. Evacuate. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies.			
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Let fire burn. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water.		
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, or loss of consciousness. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Will cause frostbite. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: CH<sub>3</sub>OCH<sub>3</sub>
- 2.3 IMO/UN Designation: 2/1033
- 2.4 DOT ID No.: 1033
- 2.5 CAS Registry No.: 115-10-6
- 2.6 NAERG Guide No.: 115
- 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Mask for organic vapors; plastic or rubber gloves; safety glasses.
- 3.2 **Symptoms Following Exposure:** Inhalation produces some anesthesia (but less than that of ethyl ether), blurring of vision, headache, intoxication, loss of consciousness. Liquid or concentrated vapor irritates eyes. Contact of liquid with skin may cause frostbite.
- 3.3 **Treatment of Exposure:** INHALATION: remove from exposure and support respiration; call physician. EYES: wash with water for at least 15 min.; consult an eye specialist. SKIN: treat frostbite by use of warm water or by wrapping the affected part in blanket.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (flammable gas)
- 4.2 **Flammable Limits in Air:** 2%-50%
- 4.3 **Fire Extinguishing Agents:** Let fire burn; shut off gas flow; cool exposed surroundings with water.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode. Vapors are heavier than air and may travel long distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 662°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 6.6 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 14.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 10.5%; O<sub>2</sub> diluent: 13.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2.1
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	1
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 46.1
- 9.3 **Boiling Point at 1 atm:** -12.5°F = -24.7°C = 248.5°K
- 9.4 **Freezing Point:** -222.7°F = -141.5°C = 131.7°K
- 9.5 **Critical Temperature:** 260.4°F = 126.9°C = 400.1°K
- 9.6 **Critical Pressure:** 780 psia = 53 atm = 5.4 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.724 at -24.7°C (liquid)
- 9.8 **Liquid Surface Tension:** 21 dynes/cm = 0.021 N/m at -40°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 15 dynes/cm = 0.015 N/m at -40°C
- 9.10 **Vapor (Gas) Specific Gravity:** 1.6
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1456
- 9.12 **Latent Heat of Vaporization:** 200 Btu/lb = 111 cal/g = 4.65 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -13,450 Btu/lb = -7,480 cal/g = -313 X 10<sup>6</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 25.62 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# DIMETHYL ETHER

DIM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E	-20 -18 -16 -14	0.536 0.537 0.538 0.539	-35 -30 -25 -20 -15	0.984 0.976 0.968 0.960 0.952	-35 -30 -25 -20 -15	0.267 0.259 0.252 0.245 0.239

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	7.000	-110 -105 -100 -95 -90 -85 -80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5	0.607 0.745 0.910 1.105 1.335 1.604 1.918 2.284 2.707 3.194 3.754 4.394 5.123 5.951 6.889 7.947 9.137 10.470 11.960 13.630 15.480 17.530	-110 -105 -100 -95 -90 -85 -80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5	0.00745 0.00902 0.01086 0.01301 0.01550 0.01839 0.02170 0.02550 0.02983 0.03476 0.04033 0.04663 0.05370 0.06164 0.07050 0.08036 0.09132 0.10350 0.11690 0.13160 0.14780 0.16560	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.313 0.322 0.332 0.342 0.352 0.361 0.371 0.381 0.390 0.400 0.410 0.420 0.429 0.439 0.449 0.459 0.468 0.478 0.488 0.498 0.507 0.517 0.527 0.536 0.546

# DIISONONYL PHTHALATE

DIN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Benzenedicarboxylic acid, di-isonyl ester Di(7-methyloctyl) phthalate Phthalic acid, bis-(7- methyloctyl) ester	Liquid  Colorless  Odorless  Floats on water.
Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible Extinguish with dry chemical, foam, or carbon dioxide.
<b>Exposure</b>	Not harmful.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life not known. Fouling to shoreline. May be harmful if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Esters  
2.2 Formula: o-C<sub>8</sub>H<sub>7</sub>(COO(C<sub>7</sub>H<sub>15</sub>)<sub>2</sub>CH(CH<sub>3</sub>))<sub>2</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification:  
51385

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Not required  
3.2 Symptoms Following Exposure: Produces no ill effects at normal temperatures, but may give off irritating vapors at high temperatures.  
3.3 Treatment of Exposure: Leave contaminated area; wash exposed skin with soap and water; flush eyes with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Nonirritating to the eyes and throat.  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: Currently not available  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Currently not available  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 164.2 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 47.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  
Category Classification  
Health Hazard (Blue)..... 0  
Flammability (Red)..... 1  
Instability (Yellow)..... 0  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 418.6  
9.3 Boiling Point at 1 atm: 172°F = 78°C = 351°K  
9.4 Freezing Point: Currently not available  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: Currently not available  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Currently not available  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

NOTES

# DIISONONYL PHTHALATE

DIN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.287 0.298 0.309 0.320 0.331 0.341 0.352 0.363 0.374 0.385 0.395 0.406 0.417 0.428 0.439 0.449 0.460 0.471 0.482 0.493 0.503 0.514 0.525 0.536 0.547

# DIISOCTYL PHTHALATE

DIO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Corflex 880 Di-(6-methylheptyl) phthalate Flexol plasticizer DIOP Hexaplas M/O Bis-(6-Methylheptyl) phthalate	Oily liquid  Colorless  Slight odor  Floats on water.
Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide.
<b>Exposure</b>	Not harmful.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and waterlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 34; Ester  
2.2 **Formula:** o-C<sub>8</sub>H<sub>17</sub>(COO(CH<sub>2</sub>)<sub>6</sub>CH(CH<sub>3</sub>)<sub>2</sub>)<sub>2</sub>  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 27554-26-3  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51385

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Not required  
3.2 **Symptoms Following Exposure:** Produces no ill effects at normal temperatures but may give off irritating vapor at high temperature.  
3.3 **Treatment of Exposure:** Leave contaminated area; wash skin with soap and water; flush eyes with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> = 22 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Not established  
3.10 **Vapor (Gas) Irritant Characteristics:** Nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 450°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing  
4.5 **Special Hazards of Combustion Products:** None  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 149.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 43.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 390.62  
9.3 **Boiling Point at 1 atm:** 1288°F = 698°C = 971°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

### NOTES

# DIISOCTYL PHTHALATE

DIO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.282 0.293 0.304 0.315 0.325 0.336 0.347 0.358 0.368 0.379 0.390 0.401 0.411 0.422 0.433 0.444 0.454 0.465 0.476 0.487 0.497 0.508 0.519 0.530 0.540

# DIISOPROPANOLAMINE

DIP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,2'-Dihydroxydipropylamine 1,1'-Iminodi-2-propanol	Liquid or solid crystals  Liquid is colorless Solid is white to light yellow  Dead fish or ammonia odor  Liquid floats and mixes with water. Solid sinks and mixes in water.
Keep people away. Avoid contact with liquid. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves) (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 8; Alkanolamine
- 2.2 Formula:  $[\text{CH}_3\text{CH}(\text{OH})\text{CH}_2]_2\text{NH}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 110-97-4
- 2.6 NAERG Guide No.: Not listed.
- 2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full face mask or amine vapor mask only if required; clean, body-covering clothing, rubber gloves, apron, boots and face shield.
- 3.2 **Symptoms Following Exposure:** Vapor concentrations too low to irritate unless exposure is prolonged. Liquid will burn eyes and skin.
- 3.3 **Treatment of Exposure:** INHALATION: if ill effects occur, remove person to fresh air and get medical help. INGESTION: if swallowed and patient is conscious and not convulsing, promptly give milk or water, then induce vomiting; get medical help. No specific antidote known. EYE AND SKIN: immediately flush with plenty of water for at least 15 min. For eyes, get medical help promptly. Remove and wash contaminated clothing before reuse.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 260°F O.C.
- 4.2 **Flammable Limits in Air:** 1.1% (calc.)- 5.4% (est.)
- 4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 580°F (calc.)
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 51.2 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 14.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 2
  - Human Oral hazard: 0
  - Human Contact hazard: I
  - Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid or solid
- 9.2 **Molecular Weight:** 133.19
- 9.3 **Boiling Point at 1 atm:** 479.7°F = 248.7°C = 521.9°K
- 9.4 **Freezing Point:** 108°F = 42°C = 315°K
- 9.5 **Critical Temperature:** 750.2°F = 399°C = 672.2°K
- 9.6 **Critical Pressure:** 529 psia = 36 atm = 3.6 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.99 at 42°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** 185 Btu/lb = 103 cal/g = 4.31 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** (est.) -12,300 Btu/lb = -6860 cal/g = -287 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) -13 Btu/lb = -7 cal/g = -0.3 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.0 psia

### NOTES

# DIISOPROPANOLAMINE

DIP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
110	61.780	117	0.525		N		N
115	61.660	118	0.525		O		O
120	61.530	119	0.525		T		T
125	61.410	120	0.525				
130	61.290	121	0.525		P		P
135	61.170	122	0.525		E		E
140	61.050	123	0.525		R		R
145	60.930	124	0.525		T		T
150	60.810	125	0.525		I		I
155	60.680	126	0.525		N		N
160	60.560	127	0.525		E		E
165	60.440	128	0.525		N		N
170	60.320	129	0.525		T		T
175	60.200	130	0.525				
180	60.080	131	0.525				
185	59.960	132	0.525				
190	59.840	133	0.525				
195	59.710	134	0.525				
200	59.590	135	0.525				
205	59.470	136	0.525				
210	59.350	137	0.525				
		138	0.525				
		139	0.525				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	110	0.001	110	0.00001		N
	I	120	0.001	120	0.00002		O
	S	130	0.002	130	0.00003		T
	C	140	0.002	140	0.00005		
	I	150	0.004	150	0.00007		P
	B	160	0.005	160	0.00011		E
	L	170	0.008	170	0.00016		R
	E	180	0.012	180	0.00022		T
		190	0.017	190	0.00032		I
		200	0.023	200	0.00044		N
		210	0.033	210	0.00061		E
		220	0.046	220	0.00083		N
		230	0.063	230	0.00113		T
		240	0.085	240	0.00151		
		250	0.115	250	0.00201		
		260	0.154	260	0.00266		
		270	0.205	270	0.00348		
		280	0.270	280	0.00453		
		290	0.353	290	0.00585		
		300	0.459	300	0.00750		
		310	0.593	310	0.00956		
		320	0.760	320	0.01210		
		330	0.968	330	0.01522		
		340	1.227	340	0.01903		
		350	1.544	350	0.02367		
		360	1.934	360	0.02927		

# DIQUAT

DIQ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aquacide Dextrone Diquat dibromide Regalon Reglone	Solid  Yellow Reddish-brown  Sinks and mixes with water.
Evacuate. Keep people away. Avoid contact with liquid or solid. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR LIQUID POISONOUS IF INHALED OR SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge  
Chemical and Physical Treatment:  
Absorb

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:**  $C_{12}H_{12}N_2X_2$  where X = Br  
2.3 **IMO/UN Designation:** 6.1/1609 (>5%); 9/1609 (<5%)  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** 85-00-7  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 59110

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear face shield, rubber gloves, rubber apron when handling concentrate. When spraying, wear waterproof foot wear and clothing.
- 3.2 **Symptoms Following Exposure:** INHALATION: No appreciable vapor pressure. Prolonged contact with spray or mist may cause oral and nasal irritation. EYES: Irritation. SKIN: Irritation. INGESTION: Vomiting, diarrhea, general malaise. Possible kidney and liver damage, dyspnea, and pulmonary edema. With large doses there may be tremors or convulsions. OTHER: May be fatal if swallowed, inhaled, or absorbed through skin.
- 3.3 **Treatment of Exposure:** Call a doctor. EYES: Irrigate for a prolonged period. SKIN: Remove clothing immediately and wash thoroughly. INGESTION: Gastric lavage, saline cathartics, forced diuresis, and symptomatic treatment.
- 3.4 **TLV-TWA:** 0.5 mg/m<sup>3</sup> inhalable particles; 0.1 mg/m<sup>3</sup> respirable particles.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Prolonged feeding produced cataract in rats and dogs. (In rat after 100 weeks at concentration 36 ppm; in dog after 15 months at concentration 150 ppm). 2.5 mg/kg for 24 months (oral-rat) caused no adverse effects.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Decomposes at high temperature, charring rather than melting or boiling.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Concentrated solutions corrode aluminum rapidly. Should not be stored in contact with metals.
- 5.3 **Stability During Transport:** Stable in original containers.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
96-hour TL<sub>m</sub>/Bluegills and fathead minnows/140 ppm and 130 ppm in hard water  
96-hour TL<sub>m</sub>/soft water/10 ppm
- 6.2 **Waterfowl Toxicity:** Oral LD<sub>50</sub> for young mallards = 564 mg/kg; mallards 5-day LC<sub>50</sub> = >5000 ppm.
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Low - when present in fish, 50% of the residual Diquat lost in <3 weeks.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical aqueous solution, 2-lb cation/gal
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 184.2 cation; 344.1 dibromide
- 9.3 **Boiling Point at 1 atm:** Not pertinent Salts decompose at high temperatures (above 300°C), charring rather than melting or boiling.
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.22 to 1.27 at 20°C
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# DIQUAT

DIQ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
70	68.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# DISULFOTON

DIS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> O,O-Diethyl-5-2-(ethylthio)ethyl phosphodithioate Di-syston Dithiosystox Thiodemeton	Liquid  Pale yellow  Characteristic sulfur compound	   Sinks and mixes slowly with water.
Evacuate. Keep people away. Avoid contact with liquid. Avoid inhalation. Wear goggles, a self-contained breathing apparatus and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Fire data not available.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: (C <sub>2</sub> H <sub>5</sub> O) <sub>2</sub> P(S)SCH <sub>2</sub> CH <sub>2</sub> SC <sub>2</sub> H <sub>5</sub> C <sub>8</sub> H <sub>18</sub> O <sub>2</sub> S <sub>2</sub> P 2.3 IMO/UN Designation: 6.1/1615 2.4 DOT ID No.: 2783 2.5 CAS Registry No.: 298-04-4 2.6 NAERG Guide No.: 152 2.7 Standard Industrial Trade Classification: 51631
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Rubber gloves, goggles, a respirator, rubber boots and other protective clothing. 3.2 <b>Symptoms Following Exposure:</b> INHALATION, INGESTION, OR ABSORPTION THROUGH SKIN: Can cause headache, anorexia, nausea, asthenia, vertigo, miosis, abdominal cramps, diarrhea, salivation, lacrimation, sweating, shortness of breath, substernal tightness, slow pulse, tremor, muscular cramps, ataxia, fever, cyanosis, pulmonary edema, areflexia, loss of sphincter control, convulsions, coma, shock, dyspnea and death. 3.3 <b>Treatment of Exposure:</b> Call physician. INHALATION AND SKIN: Speed is essential. Remove from exposure. Flood and wash exposed skin areas thoroughly with water. Remove contaminated clothing under a shower. In nonbreathing victim, immediately institute artificial respiration. Administer atropine, 2 mg intramuscularly when symptoms of intoxication are noted. Repeat every 3 to 8 minutes until signs of atropinization occur. (Mydriasis, dry mouth, rapid pulse, hot and dry skin.) EYES: Flush with water. INGESTION: Administer milk, water or salt water and induce vomiting repeatedly. Gastric lavage and saline catharsis. 3.4 TLV-TWA: 0.1 mg/m <sup>3</sup> . 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 4; LD <sub>50</sub> <50 mg/kg. 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Possible mutagen, positive in bacterial tests. Decrease in cholinesterase activity mainly in erythrocytes and mild abnormalities in liver enzyme activities in dogs. 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 76.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 21.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Currently not available  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.064 ppm/96-hour/Bluegill/LC<sub>50</sub>/hard water  
0.07 to 0.082 ppm/96-hour/Bluegill/LC<sub>50</sub>/soft water  
7.2 ppm/96-hour/Goldfish/LC<sub>50</sub>/soft water  
0.28 ppm/96-hour/Guppy/LC<sub>50</sub>/soft water  
4.1 ppm/96-hour/Fathead minnow/LC<sub>50</sub>/soft water  
6.2 **Waterfowl Toxicity:** Oral LD<sub>50</sub> Young mallard = 6.5 mg/kg 5 day LC<sub>50</sub> Mallards = 400 to 500 ppm  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 4  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical purity - minimum 94%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not listed.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1 pound  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** P039  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 274.42  
9.3 **Boiling Point at 1 atm:** 143.6°F at 0.01 mm Hg = 62°C at 0.01 mm Hg = 335.2°K at 0.01 mm Hg  
9.4 **Freezing Point:** <-13°F = <-25°C = <-248°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.144 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 9.45  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# DISULFOTON

DIS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.002		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# DIISOBUTYL PHTHALATE

DIT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Benzene dicarboxylic acid, di-(2-methylpropyl)ester Hexaplas M/1B Isobutyl phthalate Phthalic acid, di-isobutyl ester	Oily liquid  Colorless  Slight ester odor  Sinks slowly in water.
Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide, halon.
<b>Exposure</b>	LIQUID No appreciable harm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Ester  
2.2 Formula:  $\text{o-C}_6\text{H}_4(\text{COOCH}_2\text{CH}(\text{CH}_3)_2)_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 84-69-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Eye protection.  
3.2 Symptoms Following Exposure: Vapors from very hot material may irritate eyes and produce headache, drowsiness, and convulsions.  
3.3 Treatment of Exposure: Remove to fresh air. Wash affected skin areas with water. Flush eyes with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 0;  $\text{LD}_{50} = 20 \text{ g/kg (rat)}$   
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 385°F C.C.  
4.2 Flammable Limits in Air: 0.4%  
4.3 Fire Extinguishing Agents: Dry powder, carbon dioxide, foam  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 810°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 92.8 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 27.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99.6%  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: B  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 278.35  
9.3 Boiling Point at 1 atm: 568°F = 298°C = 571°K  
9.4 Freezing Point: -83°F = -64°C = 209°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 1.047 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 9.59  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

NOTES

# DIISOBUTYL PHTHALATE

DIT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
59	65.490		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.245 0.255 0.265 0.275 0.285 0.295 0.305 0.315 0.325 0.335 0.345 0.355 0.365 0.375 0.385 0.395 0.405 0.415 0.425 0.435 0.445 0.455 0.465 0.475 0.485

# DIURON

DIU

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Solid	White	Odorless
Dichlorofendism Di-on Diurex Karmex Marmex			
<p>Evacuate. Keep people away. Avoid contact with solid and dust. Avoid inhalation. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.</p>			
Fire	<p>Not flammable. POISONOUS GAS MAY BE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus and rubber overclothing.</p>		
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>SOLID Irritating to skin, eyes, nose and throat. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>		
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be harmful if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $(C_6H_5Cl)_2NHCON(CH_3)_2$   
2.3 IMO/UN Designation: 6.1/1609 (>10%); 9/1609 (<10%)  
2.4 DOT ID No.: 2757  
2.5 CAS Registry No.: 330-54-1  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 59110

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Self-contained breathing apparatus, rubber gloves, suits and boots.  
3.2 Symptoms Following Exposure: INHALATION: May cause irritation of nose and throat. EYES: Irritation. SKIN: Moderately irritating to skin.  
3.3 Treatment of Exposure: Call a doctor. Move to fresh air. EYES: Flush with water. SKIN: Wash with soap and water. INGESTION: Ingestion of solid - give activated charcoal followed in 3 to 4 hours by sodium sulfate as cathartic. For large doses, gastric lavage may be indicated.  
3.4 TLV-TWA: 10 mg/m<sup>3</sup>.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg.  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Suspected of affecting DNA (Potential mutagen). Repeated doses produce anemia in rats and perhaps methemoglobinemia if the compound is hydrolyzed in vivo to dichloroaniline. At 2500 ppm for two years growth was retarded in both rats and dogs.  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to skin.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: Not pertinent  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Highly toxic fumes are imminent  
4.6 Behavior in Fire: Decomposes at 180° to 190°C  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Currently not available  
5.5 Polymerization: Currently not available  
5.6 Inhibitor of Polymerization: Currently not available

### 6. WATER POLLUTION

6.1 Aquatic Toxicity:  
4.0 ppm/96-hour/Bluegill/LD<sub>50</sub>  
3 ppm/24-hour/Striped bass fingerling/LC<sub>50</sub>  
42 ppm/48-hour/Large mouth bass/LC<sub>50</sub>  
4.3 ppm/48-hour/Rainbow trout/LC<sub>50</sub>  
6.2 Waterfowl Toxicity: LD<sub>50</sub> Young mallards = >2000 ppm LD<sub>50</sub> Mallard 5 day = >5000 ppm  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Accumulates markedly in fish tissues  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Wettable powder 80% Granular 8%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Keep Away From Food  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 233.1  
9.3 Boiling Point at 1 atm: 356 to 374°F = 180 to 190°C = 453.2 to 463.2°K  
9.4 Freezing Point: 316.4 to 318.2°F = 158 to 159°C = 431.2 to 432.2°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: Currently not available  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 8.04  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# DIURON

DIU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.004		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DIISOPROPYLBENZENE (ALL ISOMERS)

DIX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzene, diisopropyl Cumene bottoms DIPB bis-(1-Methylethyl)-benzene	Liquid	Clear amber	Sharp penetrating and aromatic
Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Water may be ineffective on fire. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is not known. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Skim  
Contain  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 32; Aromatic Hydrocarbon  
2.2 Formula: (C<sub>6</sub>H<sub>5</sub>)(CH(CH<sub>3</sub>)<sub>2</sub>)<sub>2</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 1993  
2.5 CAS Registry No.: 25321-09-9  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Gloves impervious to aromatic hydrocarbon and splash-proof safety goggles. Approved organic cartridge respirator for exposure below 1,000 ppm. Full face piece is required above 500 ppm. Self-contained breathing apparatus or air supplied respirators above 1000 ppm. Clothing impervious to aromatic hydrocarbon.
- 3.2 **Symptoms Following Exposure:** Vapors and liquid are irritating to eyes, mucous membrane, and upper respiratory tract and can cause headache, narcosis and unconsciousness. Systemic effects can have a relatively long duration after exposure. Ingestion can be moderately to severely toxic. Liquid can cause defatting of skin and dermatitis.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Do not induce vomiting. EYES: Flush with lots of running water for 15 minutes, lifting lower and upper lids occasionally. SKIN: Wash with soap and water. Remove contaminated clothing.
- 3.4 TLV-TWA: Not listed  
3.5 TLV-STEL: Currently not available  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 1; LD<sub>50</sub> = 6.5 g/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 170°F C.C.  
4.2 Flammable Limits in Air: LEL= 0.9%, UEL= 6.5%  
4.3 Fire Extinguishing Agents: Water spray, carbon dioxide, dry chemical, alcohol foam.  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Vapors may travel considerable distance to an ignition source and flash back.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 840°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 78.5 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 21.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.  
5.2 Reactivity with Common Materials: No reaction.  
5.3 Stability During Transport: Stable.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.  
5.5 Polymerization: Will not occur.  
5.6 Inhibitor of Polymerization: Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: T  
Damage to living resources: 4  
Human Oral hazard: 0/-  
Human Contact hazard: 0/-  
Reduction of amenities: 0/-

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Ambient.  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Explosion proof type exhaust. Keep vapors below 100 PPM.  
7.5 IMO Pollution Category: A  
7.6 Ship Type: 2  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Forbidden  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not pertinent.  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 162.30  
9.3 Boiling Point at 1 atm: 397-410°F = 202.78-210°C = 475.98-483.2°K  
9.4 Freezing Point: -81.4 to 1.4°F = -63 to -17°C = 210.2 to 256.2°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 0.86  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 5.6  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES



# DIISOPROPYLBENZENE (ALL ISOMERS)

DIX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  L I M I T E D	104 154 179 206 237 256 282 320 364 408	0.019 0.097 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.272 0.288 0.304 0.319 0.335 0.350 0.364 0.379 0.393 0.407 0.421 0.434 0.447 0.460 0.473 0.485 0.497 0.509 0.521 0.532 0.543 0.554 0.565 0.576 0.586

# DIMETHYL ADIPATE

DLA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Adipic acid, dimethyl ester Dimethyl hexanedioate Hexanedioic acid, dimethyl ester Methyl adipate	Liquid                      Colorless
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with alcohol foam, dry chemical, or CO <sub>2</sub> . Wear self-contained breathing apparatus and protective clothing.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR OR MIST Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 34; Esters  
 2.2 **Formula:** CH<sub>3</sub>O<sub>2</sub>C(CH<sub>2</sub>)<sub>4</sub>CO<sub>2</sub>CH<sub>3</sub>  
 2.3 **IMO/UN Designation:** Currently not available  
 2.4 **DOT ID No.:** Not listed  
 2.5 **CAS Registry No.:** 627-93-0  
 2.6 **NAERG Guide No.:** Not listed  
 2.7 **Standard Industrial Trade Classification:** 51385

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots and heavy rubber gloves.  
 3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion, or skin absorption. May cause irritation.  
 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush immediately with copious amounts of water for at least 15 minutes. SKIN: Wash immediately with soap and copious amounts of water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Prolonged exposure may result in infertility or infant developmental abnormalities.  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 225°F C.C.  
 4.2 **Flammable Limits in Air:** LEL: 0.81% - UEL 8.1%  
 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
 4.5 **Special Hazards of Combustion Products:** Currently not available  
 4.6 **Behavior in Fire:** Currently not available  
 4.7 **Auto Ignition Temperature:** 680°F  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 45.2 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction.  
 5.2 **Reactivity with Common Materials:** No reaction.  
 5.3 **Stability During Transport:** Stable.  
 5.4 **Neutralizing Agents for Acids and Caustics:** Data not pertinent.  
 5.5 **Polymerization:** Will not occur.  
 5.6 **Inhibitor of Polymerization:** Data not pertinent.

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** Currently not available  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 3  
 Human Oral hazard: 0  
 Human Contact hazard: 1  
 Reduction of amenities: 0

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 99+%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** Not required.  
 7.4 **Venting:** Not required.  
 7.5 **IMO Pollution Category:** B  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed.  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 174.20  
 9.3 **Boiling Point at 1 atm:** 228.2-230°F = 109-110°C = 382.2-283.2°K (at 14 mm Hg= 0.0184 atm)  
 9.4 **Freezing Point:** 46.4°F = 8°C = 281.2°K  
 9.5 **Critical Temperature:** Currently not available  
 9.6 **Critical Pressure:** Currently not available  
 9.7 **Specific Gravity:** 1.063  
 9.8 **Liquid Surface Tension:** Currently not available  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** 6.0 (est.)  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
 9.12 **Latent Heat of Vaporization:** Currently not available  
 9.13 **Heat of Combustion:** Currently not available  
 9.14 **Heat of Decomposition:** Currently not available  
 9.15 **Heat of Solution:** Currently not available  
 9.16 **Heat of Polymerization:** Currently not available  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIMETHYL ADIPATE

DLA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.247 0.257 0.267 0.276 0.285 0.294 0.304 0.312 0.321 0.330 0.338 0.347 0.355 0.363 0.371 0.379 0.387 0.395 0.402 0.410 0.417 0.424 0.431 0.438 0.444

# 2,2-DICHLOROPROPANOIC ACID

DLP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dalapon 2,2-Dichloropropionic acid	Liquid  Colorless  Acrid odor  Sinks and mixes with water.
Keep people away. AVOID CONTACT WITH LIQUID. Avoid inhalation. Restrict access. Wear goggles and self-contained breathing apparatus. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air. IF IN EYES, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Chemical and Physical Treatment: Neutralize	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $\text{CH}_2\text{CCl}_2\text{COOH}$ 2.3 IMO/UN Designation: 8/1760 2.4 DOT ID No.: 1760 2.5 CAS Registry No.: 75-99-0 2.6 NAERG Guide No.: 154 2.7 Standard Industrial Trade Classification: 51377
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Protective clothing, including goggles, gloves and boots; self-contained breathing apparatus 3.2 <b>Symptoms Following Exposure:</b> Inhalation causes severe irritation of nose, mouth, and lungs. Ingestion causes severe irritation of mouth and stomach. Contact with eyes or skin causes irritation and burns. 3.3 <b>Treatment of Exposure:</b> INHALATION: move to fresh air; if patient is not breathing, give artificial respiration; keep patient quiet; get medical attention. INGESTION: give large amounts of water; get medical attention. EYES: flush with water for at least 15 min.; get medical attention. SKIN: flush with water, get medical attention if irritation persists. 3.4 TLV-TWA: 1 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; oral $\text{LD}_{50}$ = 3.65 g/kg (mouse), 7.57 g/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> 2,500 mg/m <sup>3</sup> 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Irritating fumes of hydrochloric acid may form in fire.  
4.6 **Behavior in Fire:** Volatilizes with steam  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 11.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly to form hydrochloric and pyruvic acids. The reaction is not hazardous.  
5.2 **Reactivity with Common Materials:** Very corrosive to aluminum and copper alloys. Flammable and explosive hydrogen gas may form in enclosed spaces.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; rinse with dilute sodium bicarbonate or soda ash solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 105 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water  
1 ppm/48 hr/brown shrimp/TL<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** >5,000 ppm LC<sub>50</sub>  
6.3 **Biological Oxygen Demand (BOD):** 0.04 lb/lb, 5 days, unacclimated seed 0.32 lb/lb, 5 days, acclimated seed  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grade, 90%; solid formulations of sodium and magnesium salts are sometimes referred to as Dalapon and are much less corrosive.  
7.2 **Storage Temperature:** 70-90°F  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not listed.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 143  
9.3 **Boiling Point at 1 atm:** 374°F = 190°C = 463°K  
9.4 **Freezing Point:** 46°F = 8°C = 281°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.39 at 23°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 4.9  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# 2,2-DICHLOROPROPANOIC ACID

DLP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
73	86.770		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390	0.098 0.134 0.181 0.242 0.320 0.421 0.549 0.711 0.913 1.165 1.477 1.859 2.326 2.893 3.577 4.399 5.380 6.548 7.930 9.558 11.470 13.700 16.300 19.310	160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390	0.00211 0.00283 0.00376 0.00495 0.00647 0.00838 0.01077 0.01373 0.01739 0.02188 0.02733 0.03394 0.04189 0.05140 0.06272 0.07613 0.09193 0.11050 0.13210 0.15730 0.18640 0.22000 0.25850 0.30270		N O T  P E R T I N E N T

# N,N-DIMETHYL ACETAMIDE SOLUTION (40% OR LESS)

DLS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, dimethylamide Dimethylacetamide	Liquid	Colorless	Slight ammonia-like odor
Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources and call fire department. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Toxic vapors and gases may be generated in fire. Wear full protective clothing and self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Use water spray to cool exposed containers.		
<b>Exposure</b>	Call for medical aid.  LIQUID Harmful if swallowed, inhaled, or absorbed through skin. Move to fresh air. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 10; Amides  
2.2 Formula:  $(CH_3)_2NCOCH_3$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 127-19-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51471

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear impervious protective clothing, including boots, gloves, and apron or coveralls to prevent skin contact. Use goggles or face shield where splashing is possible. Do not wear contact lenses when working with this compound.
- 3.2 **Symptoms Following Exposure:** Inhalation may cause nasal and respiratory irritation. May cause systemic poisoning. Ingestion may cause abdominal spasms, vomiting, sweating, weakness, and headache. Large doses may cause lethargy, disorientation, redness, dermatitis, and sensitization.
- 3.3 **Treatment of Exposure:** Call for medical aid. EYES: Flush with plenty of water for 15 min., lifting lids occasionally. SKIN: Flush with plenty of water for 15 min. Remove contaminated clothing and shoes. INGESTION: Induce vomiting.
- 3.4 TLV-TWA: 10 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $LD_{50} = 5.63$  g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Workers repeatedly exposed to 20-25 ppm developed jaundice. Repeated exposures in dogs caused severe fatty infiltration of the liver. Repeated exposures in rats resulted in focal necrosis of the liver.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 20 ppm.  
3.13 IDLH Value: 300 ppm  
3.14 OSHA PEL-TWA: 10 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 158°F O.C. 145°F C.C.  
4.2 **Flammable Limits in Air:** LEL: 1.8% @ 212°F; UEL: 11.5% @ 320°F.  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use halogenated extinguishing media or water.  
4.5 **Special Hazards of Combustion Products:** Emits carbon oxides, nitrogen oxides, and dimethylamine when heated to decomposition.  
4.6 **Behavior in Fire:** Sealed closed containers may rupture from pressure from heat of fire.  
4.7 **Auto Ignition Temperature:** 914°F  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 32:1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Incompatible with oxidizing agents and halogenated compounds.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades; CP.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Pressure vacuum valve.  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.  
8.2 49 CFR Class: Not pertinent.  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 87.14  
9.3 **Boiling Point at 1 atm:** 331°F = 166°C = 439°K  
9.4 **Freezing Point:** -4°F = -20°C = 253°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.937  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N,N-DIMETHYL ACETAMIDE SOLUTION (40% OR LESS)

DLS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	68	0.029	68	0.00045		C U R R E N T L Y  N O T  A V A I L A B L E

# DIMETHYLAMINE

DMA

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquefied compressed gas      Colorless      Dead fish or ammonia odor

Floats and boils on water. flammable, irritating vapor is produced.  
Boiling point is 44°F.

Evacuate.  
Keep people away. Avoid contact with liquid and vapor.  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  
Shut off ignition sources and call fire department.  
Stay upwind and use water spray to "knock down" vapor.  
Notify local health and pollution control agencies.

### Fire

FLAMMABLE.  
Flashback along vapor trail may occur.  
May explode if ignited in an enclosed area.  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  
Stop flow of gas if possible.  
Cool exposed containers and protect men effecting shutoff with water.  
Let fire burn.

### Exposure

CALL FOR MEDICAL AID.  
  
VAPOR  
Irritating to eyes, nose and throat.  
If inhaled, will cause difficult breathing.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

LIQUID  
Will burn skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amine  
2.2 Formula:  $(CH_3)_2NH$   
2.3 IMO/UN Designation: 2.0/1032  
2.4 DOT ID No.: 1032  
2.5 CAS Registry No.: 124-40-3  
2.6 NAERG Guide No.: 118  
2.7 Standard Industrial Trade Classification: 51451

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical goggles and full face shield; molded rubber acid gloves; self-contained breathing apparatus.  
3.2 **Symptoms Following Exposure:** Inhalation at high concentration (>100 ppm) causes nose and throat irritation progressing all the way to pulmonary edema. Eye and skin irritation.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air and call a physician; if breathing has stopped, administer artificial respiration and oxygen; keep victim warm and quiet; do not give stimulants. EYES: flush continuously and thoroughly with water for at least 15 min. SKIN: remove contaminated clothing immediately; flush affected area with large amounts of water and then wash with soap and water.  
3.4 **TLV-TWA:** 5 ppm  
3.5 **TLV-STEL:** Not listed  
3.6 **TLV-Ceiling:** 15 ppm  
3.7 **Toxicity by Ingestion:** Not pertinent  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** 0.047 ppm  
3.13 **IDLH Value:** 500 ppm  
3.14 **OSHA PEL-TWA:** 10 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 20°F C.C.  
4.2 **Flammable Limits in Air:** 2.8%-14.4%  
4.3 **Fire Extinguishing Agents:** Stop flow of gas. Use water spray, carbon dioxide, or dry chemical for fires in water solutions  
4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use foam  
4.5 **Special Hazards of Combustion Products:** Vapors are eye, skin and respiratory irritants  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 756°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 4.5 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 22.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No hazardous reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
50 ppm/24 hr/chub/died/fresh water  
>100 ppm/48 hr/shrimp/LC<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX/XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Anhydrous: 99.5%. Aqueous solutions: 25%, 40%, 50%, 60%.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 2

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas  
8.2 **49 CFR Class:** 2.1  
8.3 **49 CFR Package Group:** Not pertinent.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	4
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** U092  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
9.2 **Molecular Weight:** 45.08  
9.3 **Boiling Point at 1 atm:** 44.42°F = 6.9°C = 280.1°K  
9.4 **Freezing Point:** -134.0°F = -92.2°C = 181.0°K  
9.5 **Critical Temperature:** 328.3°F = 164.6°C = 437.8°K  
9.6 **Critical Pressure:** 770 psia = 52.4 atm = 5.31 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.671 at 6.9°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 1.6  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.139  
9.12 **Latent Heat of Vaporization:** 252.9 Btu/lb = 140.5 cal/g = 5.882 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -16,800 Btu/lb = -9340 cal/g = -391.0 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -515 Btu/lb = -286 cal/g = -12.0 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 31.51 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 45 psia

## NOTES



# DIMETHYLAMINE

DMA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
15	43.160	-35	0.706		N		N
20	42.950	-30	0.707		O		O
25	42.740	-25	0.709		T		T
30	42.530	-20	0.711				
35	42.320	-15	0.712		P		P
40	42.110	-10	0.714		E		E
		-5	0.716		R		R
		0	0.717		T		T
		5	0.719		I		I
		10	0.721		N		N
		15	0.722		E		E
		20	0.724		N		N
		25	0.726		T		T
		30	0.727				
		35	0.729				
		40	0.731				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	-35	1.427	-35	0.01411	0	0.323
	I	-30	1.695	-30	0.01657	25	0.337
	S	-25	2.006	-25	0.01938	50	0.350
	C	-20	2.365	-20	0.02259	75	0.364
	I	-15	2.777	-15	0.02623	100	0.378
	B	-10	3.250	-10	0.03035	125	0.391
	L	-5	3.790	-5	0.03500	150	0.405
	E	0	4.405	0	0.04024	175	0.418
		5	5.103	5	0.04612	200	0.431
		10	5.893	10	0.05269	225	0.444
		15	6.785	15	0.06003	250	0.457
		20	7.790	20	0.06820	275	0.469
		25	8.917	25	0.07726	300	0.482
		30	10.180	30	0.08730	325	0.495
		35	11.590	35	0.09839	350	0.507
		40	13.160	40	0.11060	375	0.519
		45	14.910	45	0.12410	400	0.531
		50	16.850	50	0.13880	425	0.543
		55	18.990	55	0.15500	450	0.555
		60	21.360	60	0.17260	475	0.567
		65	23.970	65	0.19180	500	0.579
		70	26.840	70	0.21280	525	0.590
		75	29.990	75	0.23550	550	0.602
		80	33.440	80	0.26020	575	0.613
		85	37.210	85	0.28690	600	0.624

# DIMETHYLETHANOLAMINE

DMB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Deanol 2-(Dimethylamino)ethanol B-Dimethylaminoethyl alcohol N,N-Dimethyl-n-(2-hydroxyethyl) amine	Liquid  Colorless  Amine odor  Floats and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear self-contained positive pressure breathing apparatus and full protective clothing. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. IF IN EYES OR ON SKIN, flush with plenty of water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 8; Alkanolamines
- 2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>NCH<sub>2</sub>CH<sub>2</sub>OH
- 2.3 IMO/UN Designation: 3.3/2051
- 2.4 DOT ID No.: 2051
- 2.5 CAS Registry No.: 108-01-0
- 2.6 NAERG Guide No.: 132
- 2.7 Standard Industrial Trade Classification: 51461

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation of the vapor or mist can cause irritation to the upper respiratory tract. Asthmatic symptoms have been reported. Extremely irritating; may cause permanent eye injury. Corrosive; will cause severe skin damage with burns and blistering. Ingestion may cause damage to the mucous membranes and gastrointestinal tract.
- 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. INGESTION: Do NOT induce vomiting. Give large quantities of water or milk or one ounce of vinegar in an equal amount of water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 2.34 g/kg, (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Chronic exposure may cause asthma and grand mal epilepsy.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.
- 3.12 **Odor Threshold:** 0.015 ppm detection; 0.045 ppm recognition
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 105°F O.C.
- 4.2 **Flammable Limits in Air:** 1.6% - 11.9%
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** May contain toxic gases including ammonia (incomplete combustion) and NOx.
- 4.6 **Behavior in Fire:** Produces gaseous nitrogen compounds that are highly toxic and irritating.
- 4.7 **Auto Ignition Temperature:** 563°F
- 4.8 **Electrical Hazards:** Class 1; Group C
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 29.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Incompatible with copper, copper alloys, zinc, galvanized steel or zinc alloys having more than 10 percent zinc by weight.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Sodium bisulfate
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 10-100 ppm/96 hr/finfish/TLm
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Ambient temperature
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 89.14
- 9.3 **Boiling Point at 1 atm:** 274.3°F = 134.6°C = 407.8°K
- 9.4 **Freezing Point:** -73.5°F = -58.6°C = 214.6°K
- 9.5 **Critical Temperature:** 572°F = 300°C = 573°K (est.)
- 9.6 **Critical Pressure:** 600 psia = 40.8 atm = 4.13 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.8870 at 20°C
- 9.8 **Liquid Surface Tension:** 27.1 dynes/cm = 0.0271 N/m at 24.5°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 3.2
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** 170.6 Btu/lb = 94.8 cal/g = 3.97 X 10<sup>5</sup> J/Kg
- 9.13 **Heat of Combustion:** 15508 Btu/lb = 8616 cal/g = 360 X 10<sup>5</sup> J/Kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIMETHYLETHANOLAMINE

DMB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	75 100 125 150 175 200 225 250	0.101 0.292 0.665 1.305 2.308 3.780 5.843 8.626	75 100 125 150 175 200 225 250	0.00174 0.00450 0.00941 0.01717 0.02857 0.04440 0.06550 0.09276		C U R R E N T L Y  N O T  A V A I L A B L E

# DIMETHYLDICHLOROSILANE

**DMD**

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Liquid  Colorless  Sharp irritating odor  Reacts violently with water. Irritating gas is produced on contact with water.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Shut off ignition sources. Call fire department. Wear goggles and self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not burn  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>SiCl<sub>2</sub>  
2.3 IMO/UN Designation: 3.2/1162  
2.4 DOT ID No.: 1162  
2.5 CAS Registry No.: 75-78-5  
2.6 NAERG Guide No.: 155  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Acid-vapor type respiratory protection; rubber gloves; chemical worker's goggles; other protective equipment as necessary to protect skin and eyes.  
3.2 **Symptoms Following Exposure:** Inhalation irritates mucous membranes. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove from exposure and support respiration; call physician if needed. EYES: flush with water for 15 min.; obtain medical attention immediately. SKIN: flush with water; obtain medical attention immediately. INGESTION: if victim is conscious, give large amounts of water followed by milk or milk of magnesia.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 15°F O.C.  
4.2 **Flammable Limits in Air:** 1.4%-9.5%  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam  
4.5 **Special Hazards of Combustion Products:** Hydrogen chloride and phosgene gases may form; both are toxic and irritating.  
4.6 **Behavior in Fire:** Difficult to extinguish. Re-ignition may occur. Contact with water applied to adjacent fires produces toxic and irritating fumes.  
4.7 **Auto Ignition Temperature:** Above 750°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 3.3 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 19.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** Reacts vigorously with water to generate hydrogen chloride (hydrochloric acid).  
5.2 **Reactivity with Common Materials:** Will react with surface moisture to generate hydrogen chloride, which is corrosive to common metals.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate or lime  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 129  
9.3 **Boiling Point at 1 atm:** 158.8°F = 70.5°C = 343.7°K  
9.4 **Freezing Point:** -122°F = -86°C = 187°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.07 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** 20.1 dynes/cm = 0.0201 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 4.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 100 Btu/lb = 58 cal/g = 2.4 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -6,000 Btu/lb = -3,300 cal/g = -140 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIMETHYLDICHLOROSILANE

DMD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	67.969	52	0.400	52	0.901	52	0.945
36	67.900	54	0.400	54	0.901	54	0.928
38	67.830	56	0.400	56	0.901	56	0.912
40	67.759	58	0.400	58	0.901	58	0.896
42	67.690	60	0.400	60	0.901	60	0.880
44	67.620	62	0.400	62	0.901	62	0.865
46	67.549	64	0.400	64	0.901	64	0.850
48	67.490	66	0.400	66	0.901	66	0.835
50	67.419	68	0.400	68	0.901	68	0.821
52	67.349	70	0.400	70	0.901	70	0.807
54	67.280	72	0.400	72	0.901	72	0.794
56	67.209	74	0.400	74	0.901	74	0.780
58	67.139	76	0.400	76	0.901	76	0.768
60	67.070	78	0.400	78	0.901	78	0.755
62	67.000	80	0.400	80	0.901	80	0.743
64	66.929	82	0.400	82	0.901	82	0.731
66	66.860	84	0.400	84	0.901	84	0.719
68	66.790	86	0.400	86	0.901	86	0.708
70	66.719			88	0.901		
72	66.650						
74	66.580						
76	66.509						
78	66.440						
80	66.379						
82	66.309						
84	66.240						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	55	1.574	55	0.03675		N
	E	60	1.788	60	0.04135		O
	A	65	2.027	65	0.04642		T
	C	70	2.292	70	0.05199		
	T	75	2.585	75	0.05810		P
	S	80	2.910	80	0.06479		E
		85	3.268	85	0.07210		R
		90	3.662	90	0.08007		T
		95	4.096	95	0.08874		I
		100	4.572	100	0.09817		N
		105	5.093	105	0.10840		E
		110	5.663	110	0.11950		N
		115	6.285	115	0.13140		T
		120	6.963	120	0.14440		
		125	7.701	125	0.15830		
		130	8.502	130	0.17330		
		135	9.371	135	0.18940		
		140	10.310	140	0.20660		
		145	11.330	145	0.22520		
		150	12.430	150	0.24500		
		155	13.610	155	0.26610		

# DIETHYLENE GLYCOL MONOBUTYL ETHER

DME

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butoxydiethylene glycol Butoxydiglycol 2-(2-Butoxyethoxy) ethanol Butyl "carbitol" Diethylene glycol monoethyl ether Diglycol monobutyl ether Dowanol DB Poly-solv DB	Liquid  Colorless  Mild pleasant odor  Mixes with water.
<b>Fire</b> Combustible. Extinguish with water, dry chemicals, alcohol foam, or carbon dioxide. Cool exposed containers with water.	
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ether  
2.2 Formula:  $C_4H_{10}OCH_2CH_2OCH_2CH_2OH$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 112-34-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety goggles or face shield.  
3.2 **Symptoms Following Exposure:** Inhalation for brief periods has no significant effect. Contact with liquid causes moderate irritation of eyes and corneal injury. Prolonged contact with skin causes only minor irritation.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; if ill effects are observed, call a doctor. EYES: immediately flush with plenty of water for at least 15 min. SKIN: wash well with soap and water. INGESTION: give large amounts of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $LD_{50} = 2 \text{ g/kg}$  (guinea pig)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 230°F O.C.  
172°F .C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, "alcohol" foam, carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 442°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 3.3 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 17.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 34% of theoretical in 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 162.2  
9.3 **Boiling Point at 1 atm:** 448°F = 231°C = 504°K  
9.4 **Freezing Point:** -90°F = -68°C = 205°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.954 at 20°C (liquid).  
9.8 **Liquid Surface Tension:** 34 dynes/cm = 0.034 N/m at 25°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 130 Btu/lb = 74 cal/g =  $3.1 \times 10^5 \text{ J/kg}$   
9.13 **Heat of Combustion:** (est.) -14,000 Btu/lb = -7,900 cal/g =  $-330 \times 10^5 \text{ J/kg}$   
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -36 Btu/lb = -20 cal/g =  $-0.84 \times 10^5 \text{ J/kg}$   
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIETHYLENE GLYCOL MONOBUTYL ETHER

DME

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	60.410	35	0.504	85	1.119	35	10.920
40	60.280	40	0.507	90	1.116	40	10.000
45	60.150	45	0.509	95	1.113	45	9.177
50	60.020	50	0.511	100	1.110	50	8.433
55	59.890	55	0.514	105	1.107	55	7.762
60	59.760	60	0.516	110	1.103	60	7.155
65	59.630	65	0.518	115	1.100	65	6.607
70	59.500	70	0.520	120	1.097	70	6.109
75	59.370	75	0.523	125	1.094	75	5.658
80	59.240	80	0.525	130	1.091	80	5.247
85	59.110	85	0.527	135	1.088	85	4.873
90	58.980	90	0.530	140	1.085	90	4.531
95	58.850	95	0.532	145	1.082	95	4.219
100	58.720	100	0.534	150	1.079	100	3.933
		105	0.537	155	1.076	105	3.672
		110	0.539	160	1.073	110	3.432
		115	0.541	165	1.070	115	3.211
		120	0.544	170	1.067	120	3.008
		125	0.546	175	1.064	125	2.821
		130	0.548	180	1.061	130	2.649
		135	0.550	185	1.058	135	2.489
		140	0.553			140	2.342
						145	2.206
						150	2.079
						155	1.962

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	220	0.159	220	0.00354		N
	I	230	0.207	230	0.00453		O
	S	240	0.266	240	0.00575		T
	C	250	0.341	250	0.00726		
	I	260	0.434	260	0.00910		P
	B	270	0.547	270	0.01134		E
	L	280	0.687	280	0.01404		R
	E	290	0.857	290	0.01727		T
		300	1.063	300	0.02114		I
		310	1.310	310	0.02572		N
		320	1.607	320	0.03115		E
		330	1.961	330	0.03752		N
		340	2.381	340	0.04499		T
		350	2.877	350	0.05369		
		360	3.460	360	0.06379		
		370	4.143	370	0.07546		
		380	4.940	380	0.08889		
		390	5.865	390	0.10430		
		400	6.936	400	0.12190		
		410	8.171	410	0.14200		
		420	9.591	420	0.16470		
		430	11.220	430	0.19050		
		440	13.070	440	0.21950		

# DIMETHYLFORMAMIDE

DMF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> N,N-Dimethylformamide DMF	Watery liquid	Colorless	Slight ammonia odor
Floats and mixes with water.			
Keep people away. Avoid contact with liquid. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, water, alcohol foam or carbon dioxide.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 10; Amide  
2.2 Formula:  $\text{HCON}(\text{CH}_3)_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2265  
2.5 CAS Registry No.: 68-12-2  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51471

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses or face shield; rubber apron and boots.  
3.2 **Symptoms Following Exposure:** Irritation of eyes, skin and nose. May cause nausea.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if he is not breathing, give artificial respiration; for difficult breathing give oxygen; call a physician. SKIN OR EYES: flush with plenty of water while removing contaminated clothing and shoes.  
3.4 **TLV-TWA:** 10 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1;  $\text{LD}_{50}$  = 5 to 15 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Causes abortions in pregnant rats, possibly in humans also.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation, such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** 100 ppm  
3.13 **IDLH Value:** 500 ppm  
3.14 **OSHA PEL-TWA:** 10 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 153°F O.C. 136°F C.C.  
4.2 **Flammable Limits in Air:** 2.2%-15.2%  
4.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide, or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Vapors are irritating  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 833°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 2.2 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 25.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0.9 lb/lb, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 73.09  
9.3 **Boiling Point at 1 atm:** 307°F = 153°C = 426°K  
9.4 **Freezing Point:** -78°F = -61°C = 212°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.950 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.101  
9.12 **Latent Heat of Vaporization:** 248 Btu/lb = 138 cal/g =  $5.78 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -11,280 Btu/lb = -6267 cal/g =  $-262.4 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -63 Btu/lb = -35 cal/g =  $-1.5 \times 10^5$  J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.16 psia

### NOTES



# DIMETHYLFORMAMIDE

DMF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	60.220	0	0.471	85	1.294	N O T  P E R T I N E N T	
50	59.880	10	0.474	90	1.289		
60	59.550	20	0.477	95	1.284		
70	59.210	30	0.479	100	1.279		
80	58.870	40	0.482	105	1.274		
90	58.540	50	0.485	110	1.269		
100	58.200	60	0.488	115	1.264		
110	57.860	70	0.490	120	1.259		
120	57.530	80	0.493	125	1.255		
130	57.190	90	0.496	130	1.250		
140	56.850	100	0.499	135	1.245		
150	56.520	110	0.502	140	1.240		
160	56.180	120	0.504	145	1.235		
170	55.850	130	0.507	150	1.230		
180	55.510	140	0.510	155	1.225		
190	55.170	150	0.513	160	1.220		
200	54.840	160	0.515	165	1.215		
210	54.500	170	0.518	170	1.210		
		180	0.521	175	1.205		
		190	0.524	180	1.201		
		200	0.527	185	1.196		
		210	0.529	190	1.191		
				195	1.186		
				200	1.181		
				205	1.176		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		0	0.003	0	0.00005	0	0.266
		10	0.005	10	0.00007	25	0.277
		20	0.008	20	0.00011	50	0.288
		30	0.012	30	0.00017	75	0.299
		40	0.018	40	0.00024	100	0.310
		50	0.026	50	0.00035	125	0.321
		60	0.039	60	0.00051	150	0.332
		70	0.055	70	0.00071	175	0.343
		80	0.079	80	0.00099	200	0.355
		90	0.110	90	0.00136	225	0.366
		100	0.152	100	0.00185	250	0.377
		110	0.208	110	0.00249	275	0.388
		120	0.281	120	0.00330	300	0.399
		130	0.376	130	0.00435	325	0.410
		140	0.499	140	0.00567	350	0.421
		150	0.656	150	0.00732	375	0.432
		160	0.854	160	0.00938	400	0.444
		170	1.102	170	0.01192	425	0.455
		180	1.412	180	0.01503	450	0.466
		190	1.794	190	0.01881	475	0.477
		200	2.264	200	0.02337	500	0.488
		210	2.838	210	0.02885	525	0.499
						550	0.510
						575	0.521
						600	0.532

# 1,1-DIMETHYLHYDRAZINE

DMH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dimazine unsym-Dimethylhydrazine UDMH	Watery liquid  Colorless  Fishy or ammonia-like odor  Floats and mixes with water.
<b>Fire</b> Keep people away. <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear chemical protective suit with self-contained breathing apparatus. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Evacuate area in case of large discharge. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED WHEN HEATED. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear chemical protective suit with self-contained breathing apparatus. Flood discharge area with water. Extinguish with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: (CH <sub>3</sub> ) <sub>2</sub> NNH <sub>2</sub> 2.3 IMO/UN Designation: 3.2/1163 2.4 DOT ID No.: 1163 2.5 CAS Registry No.: 57-14-7 2.6 NAERG Guide No.: 131 2.7 Standard Industrial Trade Classification: 51486
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Rubber gloves, boots, and apron; plastic face shield. Gas mask with ammonia (GMD) canister protects for 30 min. against 1% concentration; for longer periods or higher concentrations, use self-contained breathing apparatus. 3.2 <b>Symptoms Following Exposure:</b> Breathing of vapor causes pulmonary irritation, delayed gastrointestinal irritation, tremors, and convulsions. Contact with skin or mucous membranes causes chemical burns. Can be absorbed through skin to cause systemic intoxication and convulsions. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove victim from contaminated area, give artificial respiration and oxygen if needed; watch for signs of pulmonary edema; enforce absolute rest. INGESTION: do NOT induce vomiting; hospitalize. SKIN OR EYES: flood with water and treat as alkaline burn. 3.4 TLV-TWA: 0.01 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 3; LD <sub>50</sub> = 50 to 500 mg/kg (rat, mouse) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Mild anemia, upper respiratory irritation, and muscle tremors in dogs following chronic exposure. 3.10 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high concentrations. 3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 3.12 Odor Threshold: 6-14 ppm 3.13 IDLH Value: 15 ppm 3.14 OSHA PEL-TWA: 0.5 ppm 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 34°F C.C.  
4.2 Flammable Limits in Air: 2%-95%  
4.3 Fire Extinguishing Agents: Flood with water  
4.4 Fire Extinguishing Agents Not to Be Used: In large fires, water fog, carbon dioxide, and bicarbonate types may allow flashback and explosive re-ignition.  
4.5 Special Hazards of Combustion Products: None  
4.6 Behavior in Fire: Tends to re-ignite unless diluted with much water.  
4.7 Auto Ignition Temperature: 452-482°F  
4.8 Electrical Hazards: Class I, Group D  
4.9 Burning Rate: 3.8 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 28.6 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 7.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Dissolves, swells, and disintegrates many plastics  
5.3 Stability During Transport: Stable below 1112°F  
5.4 Neutralizing Agents for Acids and Caustics: Flush with water  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Bioaccumulation: 0  
Damage to living resources: (4)  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Propellant-grade: 98% min.  
7.2 Storage Temperature: Below 120°F  
7.3 Inert Atmosphere: Inerted  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	1

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: U098  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 60.11  
9.3 Boiling Point at 1 atm: 146.0°F = 63.3°C = 336.5°K  
9.4 Freezing Point: -71°F = -57°C = 216°K  
9.5 Critical Temperature: 480.2°F = 249°C = 522.2°K  
9.6 Critical Pressure: 865 psia = 53.5 atm = 5.40 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.791 at 20°C (liquid)  
9.8 Liquid Surface Tension: 28 dynes/cm = 0.028 N/m at 25°C  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 2.1  
9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.152  
9.12 Latent Heat of Vaporization: 261 Btu/lb = 145 cal/g = 6.07 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -14,170 Btu/lb = -7870 cal/g = -329.3 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: (est.) -30 Btu/lb = -10 cal/g = -0.6 X 10<sup>5</sup> J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# 1,1-DIMETHYLHYDRAZINE

DMH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	50.580	55	0.640		N		N
40	50.410	60	0.642		O		O
45	50.240	65	0.645		T		T
50	50.060	70	0.648				
55	49.890	75	0.651		P		P
60	49.720	80	0.654		E		E
65	49.540	85	0.656		R		R
70	49.370	90	0.659		T		T
75	49.200	95	0.662		I		I
80	49.020	100	0.665		N		N
85	48.850	105	0.667		E		E
90	48.680	110	0.670		N		N
95	48.500	115	0.673		T		T
100	48.330	120	0.676				
105	48.160						
110	47.980						
115	47.810						
120	47.640						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	0	0.300	0	0.00366	90	0.250
	I	5	0.357	5	0.00430	100	0.250
	S	10	0.423	10	0.00504	110	0.250
	C	15	0.499	15	0.00589	120	0.250
	I	20	0.587	20	0.00685	130	0.250
	B	25	0.688	25	0.00795	140	0.250
	L	30	0.804	30	0.00920	150	0.250
	E	35	0.937	35	0.01060	160	0.250
		40	1.088	40	0.01219	170	0.250
		45	1.260	45	0.01398	180	0.250
		50	1.454	50	0.01598	190	0.250
		55	1.674	55	0.01822	200	0.250
		60	1.923	60	0.02072	210	0.250
		65	2.202	65	0.02350	220	0.250
		70	2.515	70	0.02659	230	0.250
		75	2.865	75	0.03001	240	0.250
		80	3.257	80	0.03379	250	0.250
		85	3.693	85	0.03797	260	0.250
		90	4.179	90	0.04257		
		95	4.717	95	0.04762		
		100	5.314	100	0.05317		
		105	5.973	105	0.05923		
		110	6.700	110	0.06586		
		115	7.501	115	0.07309		
		120	8.381	120	0.08096		
		125	9.347	125	0.08952		

# 1,2-DIMETHYLHYDRAZINE

DML

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> sym-Dimethylhydrazine SDMH	Watery liquid	Colorless	Fishy or ammonia-like odor
Floats and mixes with water.			
<b>Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear chemical protective suit with self-contained breathing apparatus. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Evacuate area in case of large discharge. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE POISONOUS GASES ARE PRODUCED WHEN HEATED. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear chemical protective suit with self-contained breathing apparatus. Flood discharge area with water. Extinguish with water		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** (CH<sub>3</sub>)<sub>2</sub>NNHCH<sub>3</sub>  
2.3 **IMO/UN Designation:** 3.2/2382  
2.4 **DOT ID No.:** 2382  
2.5 **CAS Registry No.:** 540-73-8  
2.6 **NAERG Guide No.:** 131  
2.7 **Standard Industrial Trade Classification:** 51486

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, boots, and apron; plastic face shield. Gas mask with ammonia (GMD) canister protects for 30 min. against 1% concentration; for longer periods or higher concentrations, use self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** Breathing of vapor causes pulmonary irritation, delayed gastrointestinal irritation, tremors, and convulsions. Contact with skin or mucous membranes causes chemical burns. Can be absorbed through skin to cause systemic intoxication and convulsions.
- 3.3 **Treatment of Exposure:** INHALATION: Remove victim from contaminated area, give artificial respiration and oxygen if needed; watch for signs of pulmonary edema; enforce absolute rest. INGESTION: Do NOT induce vomiting; hospitalize. SKIN OR EYES: Flood with water and treat as alkaline burn.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 100 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Mild anemia, upper respiratory irritation, and muscle tremors in dogs following chronic exposures. Carcinogen.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Flood with water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** In large fires, water fog, carbon dioxide, and bicarbonate types may allow flashback and explosive re-ignition.
- 4.5 **Special Hazards of Combustion Products:** None
- 4.6 **Behavior in Fire:** Tends to re-ignite unless diluted with much water.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Class 1, Group D
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 7.0%; O<sub>2</sub> diluent: 7.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Dissolves, swells, and disintegrates many plastics
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (4)  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.4% as hydrochloride, 98% minimum
- 7.2 **Storage Temperature:** Below 120°F
- 7.3 **Inert Atmosphere:** Inerted
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** U099
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 60.10
- 9.3 **Boiling Point at 1 atm:** 177.8°F = 81°C = 354.2°K
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.8274 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 2.07 (est)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1,2-DIMETHYLHYDRAZINE

DML

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	51.650	77	0.680		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	35 40 45 50 55 60 65 70 75	0.336 0.407 0.486 0.576 0.679 0.798 0.937 1.100 1.297		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.308 0.319 0.331 0.343 0.355 0.367 0.379 0.390 0.402 0.414 0.426 0.438 0.450 0.461 0.473 0.485 0.497 0.509 0.521 0.532 0.544 0.556 0.568 0.580 0.592

# 2,6-DIMETHYLANILINE

DMM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aminodimethylbenzene Aniline, 2,6-dimethyl NCL-C56188 2,6-Xyldine o-Xyldine 2,6-Xylylamine	Liquid  Pale Yellow  Floats; sparingly soluble in water
<b>Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid. Notify local health and pollution agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Water may be ineffective on fire. Wear full-face self-contained breathing apparatus and full protective clothing including rubber boots and heavy rubber gloves. Extinguish with dry chemical, alcohol foam or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR/MIST Poisonous if inhaled. Irritating to eyes, nose and throat. Move the victim to fresh air. IF IN EYES, hold the eyes open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea, dizziness and headaches. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Do not burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 9; Aromatic amines  
2.2 **Formula:** (CH<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>  
2.3 **IMO/UN Designation:** 6.1/1711  
2.4 **DOT ID No.:** 1711  
2.5 **CAS Registry No.:** 87-62-7  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51454

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained breathing apparatus, rubber boots, heavy rubber gloves and protective clothing.  
3.2 **Symptoms Following Exposure:** May be fatal if inhaled, swallowed or absorbed through skin. Vapor or mist irritating to the eyes, mucous membranes and upper respiratory tract; causes skin irritation. Absorption into body leads to the formation of methemoglobin which, in sufficient concentration, may cause cyanosis. Onset may be delayed 2-4 hours or longer. Exposure can cause nausea, dizziness, headache, damage to the eyes, and blood effects.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical help. Remove the victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Immediately flush with copious amounts of water for 15 minutes. Assure adequate flushing of the eyes by separating the eyelids with fingers. SKIN: Immediately flush with copious amounts of water for 15 minutes.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 707 mg/kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Possible carcinogen  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 196°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray, carbon dioxide, dry chemical, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Container explosion may occur under fire conditions. Emits toxic fumes under fire conditions.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 51.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 121.18  
9.3 **Boiling Point at 1 atm:** 417.2°F = 214°C = 487.2°K (at 739 mm Hg = .972 atm)  
9.4 **Freezing Point:** 50-53.6°F = 10-12°C = 283-285°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.984  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.18  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2,6-DIMETHYLANILINE

DMM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E	68	0.000		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.262 0.276 0.289 0.303 0.316 0.329 0.342 0.354 0.367 0.379 0.391 0.403 0.415 0.427 0.438 0.449 0.461 0.472 0.482 0.493 0.503 0.514 0.524 0.534 0.544

# 2,6-DIETHYLANILINE

DMN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aniline, 2,6-diethyl Benzeneamine, 2,6-diethyl- (9ci)		Liquid	Colorless
		Floats, sparingly soluble in water	
Shut off ignition sources and call fire department. Avoid contact with liquid. Keep people away. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Water may be ineffective on fire. Wear full-face self-contained breathing apparatus and full protective clothing including rubber boots and heavy rubber gloves. Extinguish with dry chemical, alcohol foam or CO <sub>2</sub> . Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR/MIST Poisonous if inhaled. Irritating to eyes, nose and throat. Move the victim to fresh air. IF IN EYES, hold eyes open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea, dizziness, and headaches. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Do not burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 9; Aromatic amines  
2.2 **Formula:** (C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>NH<sub>2</sub>  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 579-66-8  
2.6 **NAERG Guide No.:** Not listed.  
2.7 **Standard Industrial Trade Classification:** 51454

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots, heavy rubber gloves and protective clothing.
- 3.2 **Symptoms Following Exposure:** May be fatal if inhaled, swallowed or absorbed through the skin. Vapor or mist is irritant to the eyes, mucous membranes, upper respiratory tract; causes skin irritation. Absorption into the body leads to the formation of methemoglobin which, in sufficient concentration, may cause cyanosis. Onset may be delayed 2-4 hours or longer. Exposure can cause nausea, dizziness, headache, damage to the eyes, and blood effects.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical help. Remove the victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Immediately flush with copious amounts of water for 15 minutes. Assure adequate flushing of the eyes by separating the eyelids with fingers. SKIN: Immediately flush with copious amounts of water for 15 minutes.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 1.8g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May be mutagenic.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 254°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray, carbon dioxide, dry chemical, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Emits toxic fumes under fire conditions.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 79.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 18.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.5%  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 149.24  
9.3 **Boiling Point at 1 atm:** 237°F = 114°C = 387.2°K  
9.4 **Freezing Point:** 37.4-39.2°F = 3-4°C = 275.2-277.2°K (at 10mmHg = 0.0132 atm)  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.906  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 5.15  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# 2,6-DIETHYLANILINE

DMN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E	68	0.000		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.262 0.276 0.289 0.303 0.316 0.329 0.342 0.354 0.367 0.379 0.391 0.403 0.415 0.427 0.438 0.449 0.461 0.472 0.482 0.493 0.503 0.514 0.524 0.534 0.544

# 2,2-DIMETHYLOCTANOIC ACID

DMO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,2-Dimethylcaprylic acid	Liquid  Colorless  Burning, rancid odor  Floats on water.
Keep people away. Avoid contact with liquid or vapor. Avoid inhalation. Wear self-contained breathing apparatus and full protective clothing. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible Wear self-contained breathing apparatus and full protective clothing. Extinguish with CO <sub>2</sub> , dry chemical, foam, or water spray.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR Harmful if inhaled or skin is exposed. Irritating to the eyes, nose, and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed or absorbed through the skin. Irritating to the eyes and skin. Remove contaminated clothing and shoes, flush affected areas with plenty of water. IF IN EYES: hold eyelids open, flush with plenty of water for at least 15 minutes. IF SWALLOWED: do nothing except keep victim warm. DO NOT INDUCE VOMITING
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 4: Organic acids  
2.2 Formula: CH<sub>3</sub>(CH<sub>2</sub>)<sub>6</sub>(CH<sub>3</sub>)<sub>2</sub>CO<sub>2</sub>H  
2.3 IMO/UN Designation: Not Listed  
2.4 DOT ID No.: Not Listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, chemical resistant gloves, chemical safety gloves, other protective clothing.
- 3.2 **Symptoms Following Exposure:** Irritating to the eyes, nose, throat, upper respiratory tract, and skin. Inhalation may be fatal as a result of spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.
- 3.3 **Treatment of Exposure:** INHALATION: Remove victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Hold eyelids open, flush with running water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes, flush affected areas with plenty of water. INGESTION: Do nothing except keep victim warm. DO NOT INDUCE VOMITING. Call a physician.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of the eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Currently not available  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: CO<sub>2</sub>, dry chemical, foam, or water spray.  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 66.6 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 20.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Caustic soda, soda ash, lime  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: None  
7.4 Venting: None  
7.5 IMO Pollution Category: C  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not Listed  
8.2 49 CFR Class: Not Pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 174.3  
9.3 Boiling Point at 1 atm: Currently not available  
9.4 Freezing Point: Currently not available  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: Currently not available  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 6.0  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# 2,2-DIMETHYLOCTANOIC ACID

DMO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.320 0.332 0.343 0.354 0.365 0.377 0.388 0.399 0.410 0.422 0.433 0.444 0.455 0.467 0.478 0.489 0.500 0.512 0.523 0.534 0.545 0.556 0.568 0.579 0.590

# DIMETHYLPOLYSILOXANE

DMP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dimethyl silicone fluids Dimethyl silicone oil Poly(dimethylsiloxane) Silicone fluids	Liquid  Colorless  Odorless  Floats on water.
<b>Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to eyes. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:**  $(CH_3)_2Si-O-[Si(CH_3)_2O]_n-Si(CH_3)_3$   
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51550

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Safety goggles.  
3.2 **Symptoms Following Exposure:** Contact of liquid with eyes may cause temporary discomfort. Does not irritate skin. Harmless when ingested.  
3.3 **Treatment of Exposure:** Except for eye contact, exposures generally do not require treatment. EYES: flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 275-635°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 820-860°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** A series of compounds having viscosities of from 50 to 100,000 cp is available.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:**  $> 300^{\circ}F = > 149^{\circ}C = > 422^{\circ}K$   
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.98 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 19-21 dynes/cm = 0.019-0.021 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.)  $-11,000 \text{ Btu/lb} = -6,200 \text{ cal/g} = -260 \times 10^3 \text{ J/kg}$   
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIMETHYLPOLYSILOXANE

DMP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	62.350	52	0.400	52	1.209		N O T
36	62.280	54	0.400	54	1.209		
38	62.210	56	0.400	56	1.209		
40	62.140	58	0.400	58	1.209		P E R T I N E N T
42	62.080	60	0.400	60	1.209		
44	62.010	62	0.400	62	1.209		
46	61.940	64	0.400	64	1.209		
48	61.870	66	0.400	66	1.209		
50	61.800	68	0.400	68	1.209		
52	61.730	70	0.400	70	1.209		
54	61.660	72	0.400	72	1.209		
56	61.590	74	0.400	74	1.209		
58	61.520	76	0.400	76	1.209		
60	61.450	78	0.400	78	1.209		
62	61.380	80	0.400	80	1.209		
64	61.310	82	0.400	82	1.209		
66	61.240	84	0.400	84	1.209		
68	61.170	86	0.400	86	1.209		
70	61.100						
72	61.030						
74	60.970						
76	60.900						
78	60.830						
80	60.760						
82	60.690						
84	60.620						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.100		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DIMETHYL SULFOXIDE

DMS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> DMSO Methyl sulfoxide	Liquid  Colorless  Mild garlic odor  Sinks and mixes with water.
Call fire department. Avoid inhalation. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, dry chemical, alcohol foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CH}_3\text{SOCH}_3$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 67-68-5
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Butyl rubber gloves, safety goggles. Respiratory filter if airborne sprays or drops are present.
- 3.2 **Symptoms Following Exposure:** Slight eye irritation.
- 3.3 **Treatment of Exposure:** Wash eyes and skin with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 0;  $\text{LD}_{50}$  above 15 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes damage to eye in dogs, pigs, rats, and rabbits.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 203°F O.C. 190°F C.C.
- 4.2 **Flammable Limits in Air:** 3%-63%
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Sulfur dioxide, formaldehyde, and methyl mercaptan can form
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 419°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 2.0 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 19.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 33,500 ppm/48 hr/bluegill/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester) or pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWP/CA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 78.13
- 9.3 **Boiling Point at 1 atm:** 372°F = 189°C = 462°K
- 9.4 **Freezing Point:** 65.5°F = 18.6°C = 291.8°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.101 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** 259 Btu/lb = 144 cal/g =  $6.03 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** -10,890 Btu/lb = -6050 cal/g =  $253.3 \times 10^5$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -97 Btu/lb = -54 cal/g =  $2.3 \times 10^5$  J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIMETHYL SULFOXIDE

DMS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
66	68.730	70	0.468		N		N
68	68.660	80	0.471		O		O
70	68.599	90	0.473		T		T
72	68.530	100	0.475				
74	68.459	110	0.477		P		P
76	68.389	120	0.480		E		E
78	68.320	130	0.482		R		R
80	68.250	140	0.484		T		T
82	68.179	150	0.486		I		I
84	68.110	160	0.488		N		N
86	68.040	170	0.491		E		E
88	67.969	180	0.493		N		N
90	67.900	190	0.495		T		T
92	67.830	200	0.497				
94	67.759	210	0.500				
96	67.690	220	0.502				
98	67.620	230	0.504				
100	67.559	240	0.506				
102	67.490	250	0.508				
104	67.419	260	0.511				
		270	0.513				
		280	0.515				
		290	0.517				
		300	0.520				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	70	0.010	70	0.00013		N
	I	80	0.014	80	0.00019		O
	S	90	0.020	90	0.00027		T
	C	100	0.029	100	0.00037		
	I	110	0.040	110	0.00051		P
	B	120	0.056	120	0.00070		E
	L	130	0.076	130	0.00094		R
	E	140	0.103	140	0.00124		T
		150	0.137	150	0.00164		I
		160	0.182	160	0.00214		N
		170	0.239	170	0.00276		E
		180	0.311	180	0.00354		N
		190	0.402	190	0.00451		T
		200	0.516	200	0.00569		
		210	0.656	210	0.00713		
		220	0.829	220	0.00888		
		230	1.041	230	0.01099		
		240	1.298	240	0.01350		
		250	1.609	250	0.01650		
		260	1.982	260	0.02004		
		270	2.427	270	0.02421		
		280	2.957	280	0.02909		

# DIMETHYL TEREPHTHALATE

DMT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Terephthalic acid, dimethyl ester	Solid or heated liquid  Liquid solidifies. Solid and liquid sink in water.	White solid or colorless liquid	Odorless
<b>Keep people away. Avoid contact with liquid.</b> <b>Avoid inhalation.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, foam, or carbon dioxide.		
<b>Exposure</b>	Call for medical aid. DUST Not harmful. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water.  LIQUID OR SOLID Heated liquid will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** 1,4-CH<sub>3</sub>OOC-C<sub>6</sub>H<sub>4</sub>-COOCH<sub>3</sub>  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 120-61-6  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Molten DMT: goggles, face shield, gauntlets, and protective clothing. Solid: dust mask, goggles.  
3.2 **Symptoms Following Exposure:** Molten DMT will cause severe burns of skin on contact.  
3.3 **Treatment of Exposure:** EYES: flush dust from eyes with water. SKIN: wash with soap and water. If burned by molten DMT, flush area immediately with cold water for at least 15 min.; apply ice pack for at least 30 min.; do not try to rub DMT off a burn or remove clothing that DMT has penetrated, because this will remove underlying skin; seek prompt medical treatment for significant burns.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 4,390 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 298°F O.C. (molten)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 1,058°F (dust)  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 5:Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.9%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Inert gas blanket is advisable.  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 194.2  
9.3 **Boiling Point at 1 atm:** 540°F = 282°C = 555°K  
9.4 **Freezing Point:** 284°F = 140°C = 413°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.2 at 20°C (solid); 1.08 at 145°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 121 Btu/lb = 67.2 cal/g = 2.81 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -10,310 Btu/lb = -5,727 cal/g = -239.6 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# DIMETHYL TEREPHTHALATE

DMT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T	310 320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480	0.824 0.772 0.725 0.682 0.642 0.605 0.572 0.541 0.512 0.485 0.461 0.438 0.417 0.397 0.378 0.361 0.345 0.330

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DICHLOROPROPENE, DICHLOROPROPANE MIXTURE

DMX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> D-D soil fumigant 1,3-Dichloropropene and 1,2-Dichloropropane Dowfume N Telone Vidden D	Liquid  Straw to amber  Pungent, garlic-like  Sinks and slowly mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear self-contained positive pressure breathing apparatus and chemical protective suit. Shut off ignition sources. Call fire department. Evacuate area. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Vapor may explode indoors, outdoors or in sewers. Flashback along vapor trail may occur. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Cool exposed containers with water. Combat fires from safe distances or protected location.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, respiratory tract, skin and digestive tract. Inhalation will cause gasping, refusal to breathe, and respiratory distress; may be fatal. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID May be fatal if swallowed or absorbed through skin. Will burn exposed tissues. IF IN EYES, hold eyelids open and flush with water for 15 minutes. IF ON SKIN, flush with water for 15 minutes; wash with soap and water. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS, have victim drink water and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 15; Substituted allyls  
2.2 **Formula:** C<sub>3</sub>H<sub>2</sub>Cl<sub>2</sub> & C<sub>3</sub>H<sub>3</sub>Cl<sub>2</sub>  
2.3 **IMO/UN Designation:** 3.3/2047  
2.4 **DOT ID No.:** 2047  
2.5 **CAS Registry No.:** 8003-19-8  
2.6 **NAERG Guide No.:** 132  
2.7 **Standard Industrial Trade Classification:** 51138

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self contained (positive pressure if available) breathing apparatus and full protective clothing. This material will penetrate ordinary rubber protective equipment such as boots and gloves; therefore chemical resistant equipment must be worn.
- 3.2 **Symptoms Following Exposure:** Toxic; may be fatal if inhaled, swallowed or absorbed through the skin. Inhalation causes gasping, refusal to breathe and respiratory distress. Contact may cause burns to skin and eyes. Ingestion may cause acute gastrointestinal distress with congestion and edema of the lungs.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention. EYES: Immediately flush eyes with running water for at least 15 min.; hold eyelids open if necessary. Continue to flush eyes with water during transport to treatment facilities. SKIN: Immediately deluge exposed area with water for at least 15 min.; Remove and isolate contaminated clothing and shoes at the site. Wash contaminated area with soap and water. INGESTION: If victim is conscious, give no more than 2 glasses of water. Induce vomiting either by giving 30 cc (2 tablespoons) Syrup of Ipecac or by touching the back of the throat. If victim is unconscious or having convulsions, do nothing but keep victim quiet and maintain normal body temperature.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 140 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Has mutagenic effects. May cause liver and kidney damage.  
3.10 **Vapor (Gas) Irritant Characteristics:** Causes intense irritation of eyes, skin and respiratory mucosa.  
3.11 **Liquid or Solid Characteristics:** Contact with liquid will cause burns to exposed surfaces.  
3.12 **Odor Threshold:** 1,3-dichloropropene (a major component): 1-3ppm (most people) 1,2-dichloropropane (a major component): 0.1 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 67°F C.C.  
4.2 **Flammable Limits in Air:** 5.3% - 14.5%  
4.3 **Fire Extinguishing Agents:** Small fires: dry chemicals, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Smoke contains hydrogen chloride and it may contain phosgene; both components are highly toxic gases.  
4.6 **Behavior in Fire:** Can react with aluminum, magnesium and their alloys. Can generate highly irritating and explosive vapors.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Class 1, group C  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Can react with aluminum, magnesium, and their alloys.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate or sand and soda ash mixture.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
320 ppm/96 hr/bluegill or sunfish/LC<sub>50</sub>/fresh water  
240 ppm/96 hr/tidewater silverside/LC<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Mixture  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirements  
7.4 **Venting:** Pressure-vacuum valve  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid.  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent (mixture)  
9.3 **Boiling Point at 1 atm:** 217-340°F = 102.8-171.1°C = 376-444.3°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.2 (temperature unknown)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DICHLOROPROPENE, DICHLOROPROPANE MIXTURE

DMX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	70	0.680		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DIMETHYLZINC

DMZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methylzinc Zinc dimethyl Zinc methyl		Liquid	Colorless
		IGNITES WHEN EXPOSED TO AIR. Reacts violently with water and produces flammable vapor.	
Evacuate. KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR. Avoid inhalation. Wear rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	IGNITES WHEN EXPOSED TO AIR. Irritating gases are produced when heated. Extinguish with dry graphite, soda ash, or other inert powder. DO NOT USE WATER, FOAM, CARBON DIOXIDE, DRY CHEMICALS OR VAPORIZING LIQUIDS ON FIRE. DO NOT USE WATER ON ADJACENT FIRES.		
<b>Exposure</b>	Call for medical aid.  VAPOR OR MIST Irritating to eyes, nose and throat. If inhaled will cause headache, nausea, vomiting or difficult breathing. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea, or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b>  2.1 <b>CG Compatibility Group:</b> Not listed. 2.2 <b>Formula:</b> (CH <sub>3</sub> ) <sub>2</sub> Zn 2.3 <b>IMO/UN Designation:</b> 4.2/1370 2.4 <b>DOT ID No.:</b> 1370 2.5 <b>CAS Registry No.:</b> Currently not available 2.6 <b>NAERG Guide No.:</b> 135 2.7 <b>Standard Industrial Trade Classification:</b> 51550
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Cartridge-type or fresh air mask for fumes or smoke; PVC fire-retardant or asbestos gloves; full face shield, safety glasses, or goggles; fire-retardant coveralls as standard wear; for special cases, use asbestos coat or rain suit. 3.2 <b>Symptoms Following Exposure:</b> Inhalation of mist or vapor causes immediate irritation of upper respiratory tract. Excessive or prolonged inhalation of fumes from ignition or decomposition may cause "metal fume fever" (sore throat, headache, fever, chills, nausea, vomiting, muscular aches, perspiration, constricting sensation in lungs, weakness, sometimes prostration). Symptoms usually last 12-24 hrs. Eyes are immediately and severely irritated by liquid, vapor, or dilute solutions. If not removed by thorough flushing with water, chemical may permanently damage cornea. Skin will undergo thermal and acid burns when chemical reacts with moisture in skin. Unless washed quickly, skin may be scarred. Treat dilute solutions with same precautions as concentrated liquid. Ingestion, while unlikely, would cause immediate burns at site of contact. Nausea, vomiting, cramps, and diarrhea may follow. Tissues may ulcerate if not treated. 3.3 <b>Treatment of Exposure:</b> INHALATION: highly unlikely, as liquid or vapor either ignites spontaneously or reacts with moisture to form methane and zinc oxide. Move victim to clean air and administer mouth-to-mouth resuscitation if breathing has ceased; give oxygen only when authorized by physician; keep victim warm and comfortable; call physician immediately. EYES: immediately flush with large amounts of water for at least 15 min., holding eyelids apart to insure thorough irrigation; use oils or ointments only when directed by physician, and do not attempt to neutralize with chemicals; get medical attention as soon as possible. SKIN: immediately flush affected area with large volumes of water; do not attempt to neutralize with chemicals; get medical attention if irritation persists. INGESTION: highly unlikely, as liquid or vapor either ignites spontaneously or reacts with moisture to form methane and zinc oxide. Do NOT induce vomiting; immediately dilute material by giving large amounts of water or milk; if vomiting occurs, give more fluids; when vomiting ceases, milk or olive oil may be given for their soothing effect; get medical attention.  3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Not pertinent 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Not pertinent 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent (ignites spontaneously)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, sand, powdered limestone  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam, halogenated agents, or carbon dioxide  
4.5 **Special Hazards of Combustion Products:** Smoke contains zinc oxide, which can irritate lungs and cause metal fume fever.  
4.6 **Behavior in Fire:** Reacts spontaneously with air or oxygen and violently with water, evolving methane. Contact with water applied to adjacent fires will intensify fire.  
4.7 **Auto Ignition Temperature:** Below 0°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously, generating flammable methane gas.  
5.2 **Reactivity with Common Materials:** Will react with surface moisture to generate flammable methane.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Not pertinent  
6.2 **Waterfowl Toxicity:** Not pertinent  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; Electronic  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Dry nitrogen gas  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Spontaneously Combustible  
8.2 **49 CFR Class:** 4.2  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 95.4  
9.3 **Boiling Point at 1 atm:** 113°F = 45°C = 318°K  
9.4 **Freezing Point:** -44°F = -42°C = 231°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.39 at 10.5°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 18 dynes/cm = 0.018 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 134.9 Btu/lb = 74.95 cal/g = 3.138 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# DIMETHYLZINC

DMZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	87.950	52	0.460	52	1.129	52	0.945
36	87.879	54	0.460	54	1.129	54	0.928
38	87.809	56	0.460	56	1.129	56	0.912
40	87.740	58	0.460	58	1.129	58	0.896
42	87.669	60	0.460	60	1.129	60	0.880
44	87.599	62	0.460	62	1.129	62	0.865
46	87.530	64	0.460	64	1.129	64	0.850
48	87.459	66	0.460	66	1.129	66	0.835
50	87.389	68	0.460	68	1.129	68	0.821
52	87.320	70	0.460	70	1.129	70	0.807
54	87.250	72	0.460	72	1.129	72	0.794
56	87.179	74	0.460	74	1.129	74	0.780
58	87.110	76	0.460	76	1.129	76	0.768
60	87.040	78	0.460	78	1.129	78	0.755
62	86.969	80	0.460	80	1.129	80	0.743
64	86.910	82	0.460	82	1.129	82	0.731
66	86.839	84	0.460	84	1.129	84	0.719
68	86.770	86	0.460	86	1.129	86	0.708
70	86.700						
72	86.629						
74	86.559						
76	86.490						
78	86.419						
80	86.349						
82	86.280						
84	86.209						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	35	2.590	35	0.04653		N
	E	40	2.942	40	0.05233		O
	A	45	3.334	45	0.05871		T
	C	50	3.769	50	0.06572		
	T	55	4.251	55	0.07340		P
	S	60	4.782	60	0.08179		E
		65	5.369	65	0.09094		R
		70	6.014	70	0.10090		T
		75	6.722	75	0.11170		I
		80	7.498	80	0.12350		N
		85	8.347	85	0.13620		E
		90	9.274	90	0.15000		N
		95	10.280	95	0.16480		T
		100	11.380	100	0.18080		
		105	12.580	105	0.19800		
		110	13.870	110	0.21640		
		115	15.280	115	0.23630		
		120	16.790	120	0.25750		

# DI-N-PROPYLAMINE

DNA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> N-Propyl-1-propanamine	Liquid  Colorless  Strong ammonia-like odor  Floats and mixes with water.
Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, coughing, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amine  
2.2 Formula:  $(\text{CH}_3\text{CH}_2\text{CH}_2)_2\text{NH}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2383  
2.5 CAS Registry No.: 142-84-7  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; butyl rubber gloves; butyl rubber apron; face shield  
3.2 **Symptoms Following Exposure:** Inhalation causes severe coughing and chest pain due to irritation of air passages; can-cause lung edema; may also cause headache, nausea, faintness, and anxiety. Ingestion causes irritation and burning of mouth and stomach. Contact with eyes causes severe irritation and edema of the cornea. Contact with skin causes severe irritation.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if he is not breathing, give artificial respiration; if breathing is difficult, give oxygen; call a physician. INGESTION: give large amount of water; get medical attention. EYES: flush with water for 15 min.; get medical attention for burns. SKIN: flush with water for 15 min.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral rat  $\text{LD}_{50}$  = 200 mg/kg (rat), 800 mg/kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Causes degenerative changes in liver and kidneys of rats and rabbits  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 45°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 6.1 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 51.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 14.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Not pertinent  
5.2 **Reactivity with Common Materials:** May attack some forms of plastics  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 20-60 ppm/24 hr/creek chub/critical range/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 98%; Pure, 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** U110  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 101.19  
9.3 **Boiling Point at 1 atm:** 228.7°F = 109.3°C = 382.5°K  
9.4 **Freezing Point:** -81°F = -63°C = 210°K  
9.5 **Critical Temperature:** 530.6°F = 277°C = 550.2°K  
9.6 **Critical Pressure:** 456 psia = 31.0 atm = 3.14 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.738 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 6.58 dynes/cm = 0.00658 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 143 Btu/lb = 79.5 cal/g 3.33 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -18,750 Btu/lb = -10,420 cal/g = -436.0 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DI-N-PROPYLAMINE

DNA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	47.010	52	0.600	N O T  P E R T I N E N T		60	0.569
36	46.960	54	0.600			70	0.528
38	46.900	56	0.600			80	0.490
40	46.840	58	0.600			90	0.457
42	46.790	60	0.600			100	0.427
44	46.730	62	0.600			110	0.400
46	46.680	64	0.600			120	0.375
48	46.620	66	0.600			130	0.353
50	46.570	68	0.600			140	0.332
52	46.510	70	0.600			150	0.314
54	46.460	72	0.600			160	0.297
56	46.400	74	0.600			170	0.281
58	46.340	76	0.600			180	0.267
60	46.290	78	0.600			190	0.254
62	46.230	80	0.600			200	0.242
64	46.180	82	0.600			210	0.231
66	46.120	84	0.600				
68	46.070	86	0.600				
70	46.010	88	0.600				
72	45.960	90	0.600				
74	45.900	92	0.600				
76	45.850	94	0.600				
78	45.790	96	0.600				
80	45.730	98	0.600				
82	45.680	100	0.600				
84	45.620	102	0.600				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.500	55	0.270	55	0.00494	0	0.345
		60	0.317	60	0.00575	25	0.360
		65	0.371	65	0.00667	50	0.375
		70	0.433	70	0.00771	75	0.390
		75	0.504	75	0.00889	100	0.405
		80	0.584	80	0.01021	125	0.419
		85	0.675	85	0.01168	150	0.433
		90	0.777	90	0.01332	175	0.447
		95	0.892	95	0.01515	200	0.460
		100	1.020	100	0.01718	225	0.474
		105	1.164	105	0.01943	250	0.487
		110	1.324	110	0.02191	275	0.499
		115	1.502	115	0.02464	300	0.512
		120	1.699	120	0.02763	325	0.524
		125	1.918	125	0.03092	350	0.537
		130	2.159	130	0.03451	375	0.549
		135	2.424	135	0.03843	400	0.560
		140	2.716	140	0.04269	425	0.572
						450	0.583
						475	0.594
						500	0.605
						525	0.616
						550	0.626
						575	0.636
						600	0.646

# M-DINITROBENZENE

DNB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,3-Dinitrobenzene meta-Dinitrobenzene Dinitrobenzol 1,3-Dinitrobenzol m-DNB	Solid  Sinks in water.  Yellow  Slight odor
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. May explode if exposed to heat or flames. Flood discharge area with water. Combat fires from behind barrier.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR OR DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 1,3-C<sub>6</sub>H<sub>4</sub>(NO<sub>2</sub>)<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/1597  
2.4 DOT ID No.: 1597  
2.5 CAS Registry No.: 99-65-0  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification: 51140

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; rubber gloves; protective clothing.  
3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes loss of color, nausea, headache, dizziness, drowsiness, and collapse. Eyes are irritated by liquid. Stains skin yellow; if contact is prolonged, can be absorbed into blood and cause same symptoms as for inhalation.  
3.3 **Treatment of Exposure:** INHALATION: remove from exposure; get medical attention for methemoglobinemia. EYES: flush with water for at least 15 min. SKIN: wash well with soap and water. INGESTION: induce vomiting, if conscious; give gastric lavage and saline cathartic; get medical attention.  
3.4 **TLV-TWA:** 0.15 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; oral LD<sub>50</sub> = 42 mg/kg (bird)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May cause liver damage, anemia, neuritis.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 50 mg/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 1 mg/m<sup>3</sup>  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water from protected location  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** May explode  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
8-10 mg/l/6 hr/minnows/min. lethal dose/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 168.1  
9.3 **Boiling Point at 1 atm:** 556°F = 291°C = 564°K  
9.4 **Freezing Point:** 194°F = 90°C = 363°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.58 at 18°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -7,378 Btu/lb = -4,099 cal/g = -171.5 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 24.70 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# M-DINITROBENZENE

DNB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.001		N		N		N
36	0.001		O		O		O
38	0.002		T		T		T
40	0.002						
42	0.003		P		P		P
44	0.003		E		E		E
46	0.004		R		R		R
48	0.004		T		T		T
50	0.005		I		I		I
52	0.006		N		N		N
54	0.006		E		E		E
56	0.007		N		N		N
58	0.007		E		E		E
60	0.008		N		N		N
62	0.008		T		T		T
64	0.009						
66	0.009						
68	0.010						
70	0.011						
72	0.011						
74	0.012						
76	0.012						
78	0.013						
80	0.013						
82	0.014						
84	0.014						

# DINITROCRESOL

DNC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,6-Dinitro-o-cresol 3,5-Dinitro-o-cresol 4,6-Dinitro-o-cresol	Solid  Yellow   Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Avoid inhalation. Wear goggles, dust respirator and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $\text{CH}_3\text{-C}_6\text{H}_3(\text{NO}_2)_2(\text{OH})$ 2.3 IMO/UN Designation: 6.1/1598 2.4 DOT ID No.: 1598 2.5 CAS Registry No.: 1335-85-9 2.6 NAERG Guide No.: 153 2.7 Standard Industrial Trade Classification: 51140
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Dust mask; goggles or face shield; protective clothing; rubber gloves 3.2 <b>Symptoms Following Exposure:</b> Very high fever is prominent sign of intoxication following absorption of a toxic dose of dinitro-o-cresol. Inhalation of dust may cause same symptoms as ingestion. Ingestion causes a feeling of well-being, profuse sweating, yellow urine, increased basal metabolism, marked thirst, vomiting, convulsions, coma, and death. Contact with eyes causes irritation. Contact with skin causes local necrosis and dangerous systemic effects. Note: Some authorities recommend that all exposed workers have blood tests regularly to determine the level of this substance. Further contact should be avoided if the level exceeds 20 micrograms per gram. 3.3 <b>Treatment of Exposure:</b> INHALATION: apply ice packs to promote heat loss; replace fluids and electrolytes; allay anxiety. INGESTION: same as for inhalation; also, give large amounts of water and induce vomiting; get medical attention. EYES: flush with water for at least 15 min. SKIN: wash thoroughly with soap and water. 3.4 TLV-TWA: 0.2 mg/m <sup>3</sup> 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 4; LD <sub>50</sub> < 50 mg/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 IDLH Value: 5.0 mg/m <sup>3</sup> 3.14 OSHA PEL-TWA: 0.2 mg/m <sup>3</sup> 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.
- 4.6 **Behavior in Fire:** Containers may explode.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.00032 ppm/4 days/naiads/LC<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 90-95%; Paste containing 55-60% water; pure.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 198
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** 176-187°F = 80-86°C = 353-359°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** (est.) >1.1 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** -7,050 Btu/lb = -3,920 cal/g = -164 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# DINITROCRESOL

DNC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 2,5-DINITROPHENOL

DNE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> gamma-Dinitrophenol 2,5-DNP	Solid crystal Yellow Sweet musty  Sinks and mixes slowly with water.
<b>Keep people away. Avoid contact with solid and dust.</b> <b>Avoid inhalation.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</b> <b>Evacuate area in case of large discharges.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Flammable. May explode if subjected to heat or flame. POISONOUS GAS IS PRODUCED WHEN HEATED. Evacuate surrounding area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from safe distance or protected location.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Chemical and Physical Treatment:  
Neutralize  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Currently not available; Phenol  
2.2 **Formula:** (NO<sub>2</sub>)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>OH  
2.3 **IMO/UN Designation:** 6.1/1599  
2.4 **DOT ID No.:** 1599  
2.5 **CAS Registry No.:** 329-71-5  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51140

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, butyl rubber gloves, goggles, protective shoes and laboratory coat.  
3.2 **Symptoms Following Exposure:** INHALATION, INGESTION OR SKIN ABSORPTION: Fatigue, thirst, sweating, flushing of face, nausea, vomiting, abdominal pain, diarrhea; restlessness, anxiety, excitement occasionally leading to convulsions; fever, tachycardia, labored respiration, cyanosis, and sometimes muscle cramps. Loss of consciousness, cessation of breathing and death. EYES: Causes dilation of pupils or posterior subcapsular opacities or cataracts. SKIN: Discoloration, irritation, and dermatitis.  
3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from contaminated area. Administer oxygen and artificial respiration as needed. EYES: Flush with water. SKIN: Wash with soap and water. INGESTION: Gastric lavage and saline cathartics. OTHER: If patient is feverish use cold packs and alcohol sponges.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> below 50 mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Liver and kidney damage, cataracts, skin lesions and peripheral neuritis.  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, CO<sub>2</sub>, foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Vapors are toxic.  
4.6 **Behavior in Fire:** Can detonate or explode when heated under confinement.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** May detonate when heated under confinement.  
5.4 **Neutralizing Agents for Acids and Cautics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 100 ppm/fish/critical concentration 30 ppm/Minnow/toxic threshold  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 100 ppm caused 50% decrease in oxygen utilization.  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 35% water.  
7.2 **Storage Temperature:** Cool.  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 184.11.  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** 226.4°F = 108°C = 381.2°K.  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.68  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 6.35.  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -6130 Btu/lb = -3406 cal/g = -142.5 X 10<sup>5</sup> J/kg.  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2,5-DINITROPHENOL

DNE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 2,6-DINITROPHENOL

DNH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> beta-Dinitrophenol o-o-Dinitrophenol DNP	Solid crystal      Yellow      Sweet, musty odor  Sinks and mixes slowly with water.
Keep people away. <b>AVOID CONTACT WITH SOLID AND DUST.</b> Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Evacuate area in case of large discharges. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Flammable. May explode if subjected to heat or flame. POISONOUS GAS IS PRODUCED WHEN HEATED. Evacuate surrounding area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from safe distance or protected location.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST: POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Currently not available; Phenol  
2.2 **Formula:** (NO<sub>2</sub>)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>OH  
2.3 **IMO/UN Designation:** 6.1/1599  
2.4 **DOT ID No.:** 1599  
2.5 **CAS Registry No.:** 573-56-8  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51140

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses, self-contained breathing apparatus, protective clothing, butyl rubber gloves and protective shoes.  
3.2 **Symptoms Following Exposure:** INHALATION, INGESTION AND SKIN ABSORPTION: Headache, anorexia, nausea, vomiting, abdominal pain, diarrhea, fever, pain in chest, difficult breathing, profuse sweating and thirst, dizziness and fatigue. SKIN: Discoloration and irritation. Corrosive to skin.  
3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from contaminated area. Administer oxygen and artificial respiration if needed. EYES: Flush with water. SKIN: Wash with soap and water. INGESTION: Gastric lavage and saline cathartics. OTHER: To reduce fever, use cold packs and alcohol baths.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> below 50 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Liver and kidney damage as well as development of cataracts. May cause skin discoloration and dermatitis.  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** 0.021 ppm.  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, CO<sub>2</sub>, foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Dissociation into irritating nitrogen oxides.  
4.6 **Behavior in Fire:** Can explode when heated under confinement.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 46.3-51.6 ppm/48 hr/bluegill/TL<sub>50</sub>/20°C  
6.2 **Waterfowl Toxicity:** 25 ppm  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Mixture 2, 3-, 2, 4-, and 2, 6-isomers.  
7.2 **Storage Temperature:** Avoid heat.  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 184.11  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** 145.4–147.2°F = 63–64°C = 336.2–337.2°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) 1.68  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 6.35  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** –6156 Btu/lb = –3420 cal/g = –143.1 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2,6-DINITROPHENOL

DNH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT PERTINENT		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

# 2,6-DINITROTOLUENE

DNL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,6-DNT Toluene, 2,6-dinitro-	Solid or heated liquid    Yellow to red    Slight  Liquid solidifies. Solid and liquid sink in water.
<b>Keep people away. AVOID CONTACT WITH LIQUID AND SOLID.</b> Avoid inhalation. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Evacuate surrounding area. Wear goggles and self-contained breathing apparatus. Combat fires from safe distance or protected location. Cool exposed containers with water. Extinguish with water spray.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID. POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS, OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Currently not available; Aromatic Hydrocarbon
- 2.2 **Formula:** (NO<sub>2</sub>)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CH<sub>3</sub>
- 2.3 **IMO/UN Designation:** 6.1/2038
- 2.4 **DOT ID No.:** 2038
- 2.5 **CAS Registry No.:** 606-20-2
- 2.6 **NAERG Guide No.:** 152
- 2.7 **Standard Industrial Trade Classification:** 51140

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses with side shields and face shield, self-contained breathing apparatus or air line masks, butyl rubber gloves, boots and protective clothing.
- 3.2 **Symptoms Following Exposure:** INHALATION, INGESTION OR SKIN ABSORPTION: Headache, weakness, nausea or dizziness, cyanosis, drowsiness, shortness of breath and collapse. Can burn eyes and skin.
- 3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from exposure. If cyanotic, oxygen can be administered. EYES: Flush with copious amounts of water. SKIN: Remove all contaminated clothing. Wash with lukewarm water and soap. INGESTION: Induce vomiting. Administer gastric lavage.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50-500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Caused methemoglobinemia and anemia. Damaged spleen and liver. Brain damage was observed as was testicular atrophy.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** 0.1 ppm in water.
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** (est.) 404°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water, Carbon dioxide, dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Emits toxic fumes of oxides of nitrogen
- 4.6 **Behavior in Fire:** May explode when exposed to heat or flame.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Solid
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 10-100 ppm/96 hr/fish/TL<sub>m</sub>
- 6.2 **Waterfowl Toxicity:** Not pertinent
- 6.3 **Biological Oxygen Demand (BOD):** Not pertinent
- 6.4 **Food Chain Concentration Potential:** Not pertinent
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical mixtures such as 80-20 mix of 2, 4- and 2, 6-isomers available. Hazard properties are the same.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** A
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U106
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 182.13
- 9.3 **Boiling Point at 1 atm:** Not pertinent-decomposes
- 9.4 **Freezing Point:** 140.9°F = 60.5°C = 333.7°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.283 at 111°C
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 6.28
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** -8099 Btu/lb = -4499 cal/g = -188.3 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# 2,6-DINITROTOLUENE

DNL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT PERTINENT		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	CURRENTLY NOT AVAILABLE		NOT PERTINENT		NOT PERTINENT		CURRENTLY NOT AVAILABLE

# O-DINITROBENZENE

DNO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Dinitrobenzene o-Dinitrobenzol	Solid  Colorless to yellow  Sinks and slowly mixes with water.
Keep people away. AVOID CONTACT WITH SOLID AND DUST. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Evacuate area in case of large discharge. Protect water intakes. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. MAY EXPLODE IF SUBJECTED TO HEAT, SHOCK, OR FRICTION. POISONOUS GAS IS PRODUCED WHEN HEATED. Evacuate surrounding area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from safe distance or protected location; Extinguish with water, carbon dioxide, dry chemical, or carbon tetrachloride.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST. POISONOUS IF INHALED, OR IF SKIN IS EXPOSED. Move to fresh air. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If breathing has stopped, give artificial respiration.  SOLID. POISONOUS IF SWALLOWED. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>6</sub> H <sub>4</sub> (NO <sub>2</sub> ) <sub>2</sub> 2.3 IMO/UN Designation: 6.1/1597 2.4 DOT ID No.: 1597 2.5 CAS Registry No.: 528-29-0 2.6 NAERG Guide No.: 152 2.7 Standard Industrial Trade Classification: 51140
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Full protective gastight outerwear and self-contained breathing apparatus. 3.2 <b>Symptoms Following Exposure:</b> INHALATION, INGESTION, OR SKIN ABSORPTION: Headache, vertigo and vomiting followed by exhaustion, numbness of the legs, staggering and collapse. Intense methemoglobinemia may lead to asphyxia severe enough to injure the CNS. EYES: Irritation. SKIN: Stains skin yellow. 3.3 <b>Treatment of Exposure:</b> Call a doctor. INHALATION: Remove from contaminated area. If having breathing difficulty, give oxygen. If breathing stops give artificial respiration. EYES: Flush with running water. SKIN: Remove contaminated clothing and wash with soap and water. INGESTION: Gastric lavage followed by saline catharsis. 3.4 TLV-TWA: 0.15 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 4; LD <sub>50</sub> < 50 mg/kg 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Weight loss, anemia, weakness, irritability, and liver damage may occur. Skin may be discolored. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Not pertinent 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 50 mg/m <sup>3</sup> 3.14 <b>OSHA PEL-TWA:</b> 1 mg/m <sup>3</sup> 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 302°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, CO<sub>2</sub>, or dry chemical.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Emits highly toxic fumes of oxides of nitrogen. May explode.  
4.6 **Behavior in Fire:** Severe explosion hazard when exposed to heat or flame, or when shocked.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Can react vigorously with oxidizing materials.  
5.3 **Stability During Transport:** May explode when shocked or heated under confinement.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 8-10 ppm/6 hr/minnow/minimum lethal dose/hard water/23°C  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** May have accumulative effects.  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 100%  
7.2 **Storage Temperature:** Cool  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	4

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 168.11  
9.3 **Boiling Point at 1 atm:** 606°F = 319°C = 592.2°K  
9.4 **Freezing Point:** 244.4°F = 118°C = 391.2°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.31 at 20°C  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 5.8  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 145.8 Btu/lb = 81.0 cal/g = 3.39 X 10<sup>5</sup> J/kg = -167 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -7187 Btu/lb = -3993 cal/g = -167 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 32.25 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# O-DINITROBENZENE

DNO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 2,4-DINITROPHENOL

DNP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aldifen alpha-Dinitrophenol 1-Hydroxy-2,4-dinitro-benzene	Solid crystal  Yellow    Sweet, musty odor   Sinks in water.
<b>Keep people away. AVOID CONTACT WITH SOLID AND DUST.</b> Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Evacuate area in case of large discharges. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible May explode if subjected to heat or flame. POISONOUS GAS IS PRODUCED WHEN HEATED. Evacuate surrounding area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from safe distance or protected location.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $\text{HO}C_6\text{H}_3(\text{NO}_2)_2$ -2,4 2.3 IMO/UN Designation: 1.0/0076 2.4 DOT ID No.: 0076 2.5 CAS Registry No.: 51-28-5 2.6 NAERG Guide No.: Not listed. 2.7 Standard Industrial Trade Classification: 51140
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus; butyl rubber gloves; goggles; lab coat; protective shoes. 3.2 <b>Symptoms Following Exposure:</b> Liver damage, metabolic stimulant, dermatitis, dilation of pupils. 3.3 <b>Treatment of Exposure:</b> Remove victim from contaminated area and wash exposed skin with soap and water. Administer oxygen if respiratory problems develop. Refer to a doctor. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 4; LD <sub>50</sub> below 50 mg/kg 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Produces clouding of lens of eye (cataracts) in animals and humans, birth defects in chick embryos. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Not pertinent 3.11 <b>Liquid or Solid Characteristics:</b> Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide, foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Vapors are toxic  
4.6 **Behavior in Fire:** Can detonate or explode when heated under confinement  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Reacts with oxidizing materials and combustibles.  
5.3 **Stability During Transport:** May detonate when heated under confinement  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 200 ppm/0.3 hr/minnow/died/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Explosive  
8.2 **49 CFR Class:** 1-1D  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** P084  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 184.1  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** 235°F = 113°C = 386°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.68 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# 2,4-DINITROPHENOL

DNP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 2,4-DINITROANILINE

DNT

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid powder or crystals

Yellow

Musty odor

Sinks in water.

Keep people away. AVOID CONTACT WITH SOLID AND DUST.  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  
Evacuate area in case of large discharge.  
Call fire department.  
Notify local health and pollution control agencies.

### Fire

Combustible.  
May explode if subjected to heat or flame.  
POISONOUS GAS IS PRODUCED WHEN HEATED.  
Evacuate surrounding area.  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  
Combat fires from safe distance or protected location with unmanned hose holder or monitor nozzle.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
POISONOUS IF INHALED.  
Move to fresh air.

SOLIDS  
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.  
Irritating to eyes.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS or HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Dredge  
Do not burn

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{NH}_2\text{C}_6\text{H}_3(\text{NO}_2)_2$ : 2, 4  
2.3 IMO/UN Designation: 6.1/1596  
2.4 DOT ID No.: 1596  
2.5 CAS Registry No.: 97-02-9  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51140

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; butyl rubber gloves; eye goggles; plastic lab coat; protective shoes.
- 3.2 **Symptoms Following Exposure:** May cause headache, nausea, stupor. Irritating to skin and mucous membrane.
- 3.3 **Treatment of Exposure:** INHALATION: artificial respiration if necessary. INGESTION: induce vomiting; give universal antidote; get prompt medical care. CONTACT WITH SKIN AND EYES: remove victim from exposure; wash exposed skin with warm water and soap; flush eyes with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral rate  $\text{LD}_{50} = 418 \text{ mg/kg}$
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first degree burns on short exposure; may cause second degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 435°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** For small fires, use water, dry chemical, foam or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing
- 4.5 **Special Hazards of Combustion Products:** Vapors and combustion gases are irritating
- 4.6 **Behavior in Fire:** May explode
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 39.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 11.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Reacts with oxidizing materials.
- 5.3 **Stability During Transport:** May detonate when heated under confinement
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical and Pure
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 3              |
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 183.12
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** 368°F = 187°C = 460°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.615 at 15°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# 2,4-DINITROANILINE

DNT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 3,4-DINITROTOLUENE

DNU

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 3,4-DNT Toluene, 3,4-dinitro-	Solid or heated liquid    Yellow to Red    Slight  Liquid solidifies. Solid and liquid sink in water.
keep people away. AVOID CONTACT WITH LIQUID AND SOLID. Avoid inhalation. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Evacuate surrounding area. Wear goggles and self-contained breathing apparatus. Combat fire from safe distance or protected location. Cool exposed containers with water. Extinguish with water spray.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS, OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Currently not available; Aromatic Hydrocarbon 2.2 Formula: (NO <sub>2</sub> ) <sub>2</sub> C <sub>6</sub> H <sub>4</sub> CH <sub>3</sub> 2.3 IMO/UN Designation: 6.1/2038 2.4 DOT ID No.: 2038 2.5 CAS Registry No.: 610-39-9 2.6 NAERG Guide No.: 152 2.7 Standard Industrial Trade Classification: 51140
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Safety glasses with side shield or safety goggles and plastic face shield. Self-contained breathing apparatus or air line mask. Butyl rubber gloves, boots and protective clothing. 3.2 <b>Symptoms Following Exposure:</b> INHALATION, INGESTION OR SKIN ABSORPTION: Headache, weakness, nausea or dizziness, cyanosis, drowsiness, shortness of breath and collapse. EYES AND SKIN: Can burn eyes and skin. 3.3 <b>Treatment of Exposure:</b> Call a doctor. INHALATION: Remove from exposure. If cyanotic, oxygen can be administered. EYES: Flush with copious amounts of water. SKIN: Remove all contaminated clothing. Wash with lukewarm water and soap. INGESTION: Induce vomiting. Administer gastric lavage. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 2; LD <sub>50</sub> = .5-5 g/kg 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Caused melhemoglobinemia and anemia. Damaged spleen and liver. Brain damage was observed as was testicular atrophy. 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: (est.) 404°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Water, CO<sub>2</sub>, dry chemical  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Emits toxic fumes of oxides of nitrogen.  
4.6 Behavior in Fire: May explode when exposed to heat or flame.  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 40.5 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 12.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Solid  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 10 ppm/96 hr/fish/TL<sub>m</sub>  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: A  
7.6 Ship Type: 2  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 182.13  
9.3 Boiling Point at 1 atm: Not pertinent-decomposes  
9.4 Freezing Point: 140–141.8°F = 60–61°C = 333.2–334.2°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 1.2594 at 111°C  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 6.28  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: –8075 Btu/lb = –4486 cal/g = –187.7 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES



# 3,4-DINITROTOLUENE

DNU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# DIISONONYL ADIPATE

DNY

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless
<p><b>Wear full impervious protective clothing and approved respirator.</b>  <b>Shut off ignition sources and call fire department.</b>  <b>Notify local health and pollution control agencies.</b>  <b>Protect water intakes.</b></p>		
<b>Fire</b>	<p>Combustible.  Wear full protective clothing with self-contained breathing apparatus.  Extinguish fire with dry chemical, alcohol foam, carbon dioxide.  Use water spray to cool exposed containers.</p>	
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR  Move victim to fresh air.  If breathing has stopped, give artificial respiration.  If breathing is difficult, give oxygen.</p> <p>LIQUID  Remove contaminated clothing and shoes.  Wash affected areas with soap and water.  IF IN EYES, hold eyelids open and flush with plenty of water.</p>	
<b>Water Pollution</b>	<p>Effect of low concentrations on aquatic life is unknown.  May be dangerous if it enters water intakes.  Notify local health and wildlife officials.  Notify operators of nearby water intakes.</p>	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 34; Esters  
2.2 **Formula:** C<sub>18</sub>H<sub>34</sub>OOC(CH<sub>2</sub>)<sub>8</sub>COOC<sub>18</sub>H<sub>34</sub>  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.
- 4.5 **Special Hazards of Combustion**  
**Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 159.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 47.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 398.63  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: XX

### NOTES

# DIISONONYL ADIPATE

DNY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# P-DINITROBENZENE

DNZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,4-Dinitrobenzene	Solid  Colorless to yellow  Sinks and mixes slowly with water.
Keep people away. AVOID CONTACT WITH SOLID AND DUST. Avoid inhalation. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Evacuate area in case of large discharge. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. MAY EXPLODE IF SUBJECTED TO HEAT, SHOCK, OR FRICTION. POISONOUS GAS IS PRODUCED WHEN HEATED. Evacuate surrounding area. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Combat fires from safe distance or protected location. Extinguish with water, CO <sub>2</sub> , dry chemical, or carbon tetrachloride.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED, OR IF SKIN IS EXPOSED. Move to fresh air. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If breathing has stopped, give artificial respiration.  SOLID POISONOUS IF SWALLOWED. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>6</sub> H <sub>4</sub> (NO <sub>2</sub> ) <sub>2</sub> 2.3 IMO/UN Designation: 6.1/1597 2.4 DOT ID No.: 1597 2.5 CAS Registry No.: 25154-54-5 2.6 NAERG Guide No.: 152 2.7 Standard Industrial Trade Classification: 51140
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus, safety glasses, protective clothing and rubber gloves. 3.2 <b>Symptoms Following Exposure:</b> INHALATION OR INGESTION: Headache, vertigo, nausea, vomiting, diarrhea, fever, rapid weak pulse, decreased blood pressure, cyanosis, exhaustion, hepatomegaly, jaundice, albuminuria, hematuria, visual scotomata, amblyopia and nystagmus. EYES: Irritation. SKIN: Stains skin yellow; if skin contact is prolonged, can be absorbed into blood causing same symptoms as for inhalation. 3.3 <b>Treatment of Exposure:</b> Call a physician. INHALATION: Remove from contaminated area. Remove all clothing and wash entire body with soap and water. Get medical attention for methemoglobinemia. EYES: Flush with water for at least 15 minutes. SKIN: Remove from contaminated area. Remove all clothing and wash entire body with soap and water. Get medical attention for methemoglobinemia. INGESTION: Gastric lavage followed by saline catharsis. 3.4 TLV-TWA: 0.15 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 4; LD <sub>50</sub> below 50 mg/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Secondary anemia, liver damage. Irritability, weakness, headache, anorexia, weight loss, nausea, vomiting, cyanosis, dyspnea and skin discoloration. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Not pertinent 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 50 mg/m <sup>3</sup> 3.14 OSHA PEL-TWA: 1 mg/m <sup>3</sup> 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 302°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, CO<sub>2</sub>, dry chemical or carbon tetrachloride  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** When heated to decomposition toxic fumes of oxides of nitrogen released.  
4.6 **Behavior in Fire:** Decomposes explosively. Can be detonated by shock or heat under confinement that will permit high pressure buildup  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Severe explosion hazard.  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 8 to 10 mg/l/6-hour/minimum lethal dose/Minnows/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 168.11  
9.3 **Boiling Point at 1 atm:** 570.2°F = 299°C = 572.2°K  
9.4 **Freezing Point:** 343.4°F = 173°C = 446.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.625 at 18°C  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 142.8 btu/lb = 79.4 cal/g = 3.32 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -7193 btu/lb = -3996 cal/g = -167.2 X 10<sup>5</sup> J/kg These values for meta isomer. Use as estimate for p.  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** 39.99 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# P-DINITROBENZENE

DNZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T	75 80 85 90 95 100 105 110 115 120 125 130 135 140	0.260 0.262 0.263 0.265 0.266 0.268 0.269 0.271 0.273 0.274 0.276 0.277 0.279 0.281		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
0	212.000	320 330 340 350 360 370 380 390 400 410 420 430 440 450 460 470 480 490 500	0.247 0.311 0.388 0.481 0.594 0.728 0.888 1.078 1.302 1.564 1.872 2.231 2.647 3.130 3.686 4.327 5.061 5.901 6.859		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# DIOCTYL ADIPATE

DOA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Adipic acid, bis (2-ethylhexyl) ester Adipol 2EH Di (2-ethylhexyl) adipate DOA		Oily liquid  Colorless  Odorless  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Currently not available; Ester  
 2.2 **Formula:**  $C_{18}H_{34}O_4$   
 2.3 **IMO/UN Designation:** Not listed  
 2.4 **DOT ID No.:** Not listed  
 2.5 **CAS Registry No.:** Currently not available  
 2.6 **NAERG Guide No.:** Not listed  
 2.7 **Standard Industrial Trade Classification:** 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** None required  
 3.2 **Symptoms Following Exposure:** Low toxicity; no reports of injury in industrial handling.  
 3.3 **Treatment of Exposure:** CONTACT WITH SKIN AND EYES: wipe off and wash skin with soap and water. Treat like lubricating oil. Flush eyes with water. Remove to fresh air.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 1;  $LD_{50}$  = 5 to 15 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** Odorless  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 390°F O.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Currently not available  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
 4.5 **Special Hazards of Combustion Products:** None  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 145.2 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 43.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.6%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open  
 7.5 **IMO Pollution Category:** D  
 7.6 **Ship Type:** Data not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 371  
 9.3 **Boiling Point at 1 atm:** Very high  
 9.4 **Freezing Point:** Not pertinent  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.928 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** (est.) 15 dynes/cm = 0.015 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** -15,430 Btu/lb = -8580 cal/g = -359 X 10<sup>3</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIOCTYL ADIPATE

DOA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	58.210	85	0.452	32	1.040	55	15.450
61	58.170	90	0.455	34	1.040	60	14.460
62	58.140	95	0.459	36	1.040	65	13.560
63	58.100	100	0.462	38	1.040	70	12.730
64	58.070	105	0.465	40	1.040	75	11.960
65	58.030	110	0.468	42	1.040	80	11.250
66	58.000	115	0.471	44	1.040	85	10.600
67	57.960	120	0.475	46	1.040	90	9.994
68	57.930	125	0.478	48	1.040	95	9.434
69	57.890	130	0.481	50	1.040	100	8.914
70	57.860	135	0.484	52	1.040	105	8.431
71	57.820	140	0.487	54	1.040	110	7.983
72	57.790	145	0.491	56	1.040	115	7.565
73	57.750	150	0.494	58	1.040	120	7.176
74	57.720			60	1.040	125	6.813
75	57.690			62	1.040	130	6.474
76	57.650			64	1.040	135	6.157
77	57.620			66	1.040	140	5.860
78	57.580			68	1.040		
79	57.550			70	1.040		
80	57.510			72	1.040		
81	57.480			74	1.040		
82	57.440			76	1.040		
83	57.410						
84	57.370						
85	57.340						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DODECENE

DOD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dodecene (non-linear) Propylene tetramer Tetrapropylene	Watery liquid  Colorless  Pleasant odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $C_{12}H_{24}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 6842-15-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; no respiratory protection needed if ventilation is adequate.
- 3.2 **Symptoms Following Exposure:** No inhalation hazard expected. Aspiration hazard if ingested. Minor skin and eye irritation.
- 3.3 **Treatment of Exposure:** INHALATION: Remove victim to fresh air. INGESTION: do NOT induce vomiting. Do NOT lavage. Give vegetable oil and demulcents; call physician. EYE CONTACT: flush with water for 15 min. SKIN CONTACT: wash with soap and water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> above 15 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Slight smarting of eyes and respiratory system at high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 134°F O.C. 212°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water fog, foam, carbon dioxide, dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 491°F (est.)
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 85.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 24.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98.5-99+% olefin
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** (B)
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 168.31
- 9.3 **Boiling Point at 1 atm:** 365–385°F = 185–196°C = 458–469°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.77 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 23.0 dynes/cm = 0.0230 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** –19,100 Btu/lb = –10,600 cal/g = –444 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.01 psia

### NOTES



# DODECENE

DOD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	48.740	32	0.478	32	1.040	40	1.698
50	48.480	34	0.478	34	1.040	50	1.541
60	48.230	36	0.478	36	1.040	60	1.404
70	47.980	38	0.478	38	1.040	70	1.283
80	47.720	40	0.478	40	1.040	80	1.177
90	47.470	42	0.478	42	1.040	90	1.082
100	47.220	44	0.478	44	1.040	100	0.999
110	46.960	46	0.478	46	1.040	110	0.924
120	46.710	48	0.478	48	1.040	120	0.858
130	46.460	50	0.478	50	1.040	130	0.798
140	46.200	52	0.478	52	1.040	140	0.744
150	45.950	54	0.478	54	1.040	150	0.695
160	45.700	56	0.478	56	1.040	160	0.651
170	45.450	58	0.478	58	1.040	170	0.611
180	45.190	60	0.478	60	1.040	180	0.575
190	44.940	62	0.478	62	1.040	190	0.541
200	44.690	64	0.478	64	1.040	200	0.511
210	44.430	66	0.478	66	1.040	210	0.483
		68	0.478	68	1.040		
		70	0.478	70	1.040		
		72	0.478	72	1.040		
		74	0.478	74	1.040		
		76	0.478	76	1.040		
		78	0.478	78	1.040		
		80	0.478	80	1.040		
		82	0.478	82	1.040		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	120	0.022	120	0.00059	0	0.336
	N	130	0.031	130	0.00082	25	0.350
	S	140	0.043	140	0.00113	50	0.365
	O	150	0.060	150	0.00153	75	0.380
	L	160	0.081	160	0.00206	100	0.394
	U	170	0.110	170	0.00273	125	0.408
	B	180	0.147	180	0.00359	150	0.422
	L	190	0.194	190	0.00468	175	0.436
	E	200	0.254	200	0.00604	200	0.450
		210	0.330	210	0.00772	225	0.463
		220	0.425	220	0.00979	250	0.476
		230	0.542	230	0.01232	275	0.489
		240	0.686	240	0.01538	300	0.502
		250	0.863	250	0.01907	325	0.515
		260	1.077	260	0.02347	350	0.528
		270	1.336	270	0.02870	375	0.540
		280	1.645	280	0.03487	400	0.552
		290	2.014	290	0.04212	425	0.564
		300	2.451	300	0.05059	450	0.576
		310	2.965	310	0.06043	475	0.588
		320	3.570	320	0.07180	500	0.599
		330	4.275	330	0.08488	525	0.610
		340	5.093	340	0.09986	550	0.621
		350	6.039	350	0.11700	575	0.632
		360	7.129	360	0.13640	600	0.643
		370	8.377	370	0.15830		

# DODECYL PHENOL

DOL

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Straw colored	Phenolic odor
<b>Toxic by ingestion, inhalation, or skin contact.</b> <b>Avoid contact with liquid and vapor.</b> <b>Avoid inhalation.</b> <b>Wear full impervious protective clothing and approved respirator.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 21; Phenols, cresols  
**2.2 Formula:** C<sub>12</sub>H<sub>11</sub>OH  
**2.3 IMO/UN Designation:** Currently not available  
**2.4 DOT ID No.:** Not listed.  
**2.5 CAS Registry No.:** 27193-86-8  
**2.6 NAERG Guide No.:** Not listed  
**2.7 Standard Industrial Trade Classification:** 51243

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat. Toxic by ingestion, inhalation, or skin contact.
- 3.3 Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.
- 3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Currently not available  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- 3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 325°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water.  
**4.5 Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Not listed.  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 119.0 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 33.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction.  
**5.2 Reactivity with Common Materials:** Currently not available  
**5.3 Stability During Transport:** Stable.  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent.  
**5.5 Polymerization:** Will not polymerize.  
**5.6 Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Technical grades.  
**7.2 Storage Temperature:** Ambient.  
**7.3 Inert Atmosphere:** No requirement.  
**7.4 Venting:** Open.  
**7.5 IMO Pollution Category:** A  
**7.6 Ship Type:** 1  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed.  
**8.2 49 CFR Class:** Not pertinent.  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 262.44  
**9.3 Boiling Point at 1 atm:** 310 - 335°F = 154 - 168°C = 427 - 441°K  
**9.4 Freezing Point:** Currently not available  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 0.94 @ 20°C  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** Currently not available  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Not pertinent.  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# DODECYL PHENOL

DOL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	7.840		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DIOCTYL PHTHALATE

DOP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Di-(2-ethylhexyl) phthalate DOP Bis-(2-Ethylhexyl)phthalate Octoil Phthalic acid, bis (2-ethylhexyl ester)	Oilly liquid  Colorless  Slight odor  Floats on water.
Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide.
<b>Exposure</b>	Not harmful.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 34; Ester  
2.2 **Formula:**  $\text{C}_{24}\text{H}_{40}\text{O}_4$   
 $\text{C}_8\text{H}_{17}(\text{COOCH}_2\text{CH}(\text{C}_6\text{H}_{13})(\text{CH}_2)_7\text{CH}_3)_2$   
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 117-84-0  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51385

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Not required  
3.2 **Symptoms Following Exposure:** Produces no ill effects at normal temperatures but may give off irritating vapor at high temperature.  
3.3 **Treatment of Exposure:** Leave contaminated area; wash skin with soap and water; flush eyes with water  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> above 15 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Not established  
3.10 **Vapor (Gas) Irritant Characteristics:** Nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 425°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing  
4.5 **Special Hazards of Combustion Products:** None  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 149.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 43.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** U107  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 390.6  
9.3 **Boiling Point at 1 atm:** 727°F = 386°C = 659°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.980 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 15 dynes/cm = 0.015 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -15,130 Btu/lb = -8410 cal/g = -352 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

NOTES

# DIOCTYL PHTHALATE

DOP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	62.350	32	0.478	45	0.944	32	15.670
36	62.280	34	0.478	50	0.942	34	14.770
38	62.210	36	0.478	55	0.940	36	13.920
40	62.150	38	0.478	60	0.939	38	13.140
42	62.080	40	0.478	65	0.937	40	12.400
44	62.010	42	0.478	70	0.935	42	11.700
46	61.940	44	0.478	75	0.933	44	11.060
48	61.870	46	0.478	80	0.931	46	10.450
50	61.800	48	0.478	85	0.929	48	9.878
52	61.730	50	0.478	90	0.927	50	9.343
54	61.660	52	0.478	95	0.925	52	8.841
56	61.590	54	0.478	100	0.924	54	8.370
58	61.520	56	0.478	105	0.922	56	7.927
60	61.450	58	0.478	110	0.920	58	7.511
62	61.380	60	0.478	115	0.918	60	7.119
64	61.310	62	0.478	120	0.916	62	6.751
66	61.240	64	0.478	125	0.914	64	6.404
68	61.170	66	0.478	130	0.912	66	6.078
70	61.100	68	0.478	135	0.911	68	5.770
72	61.040	70	0.478	140	0.909	70	5.481
74	60.970	72	0.478	145	0.907	72	5.207
76	60.900	74	0.478	150	0.905	74	4.950
78	60.830	76	0.478	155	0.903	76	4.707
80	60.760			160	0.901		
82	60.690			165	0.899		
84	60.620			170	0.897		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.005	340	0.006	340	0.00026		N
		345	0.007	345	0.00030		O
		350	0.008	350	0.00036		T
		355	0.009	355	0.00041		
		360	0.011	360	0.00048		P
		365	0.013	365	0.00056		E
		370	0.015	370	0.00064		R
		375	0.017	375	0.00074		T
		380	0.020	380	0.00086		I
		385	0.023	385	0.00099		N
		390	0.026	390	0.00113		E
		395	0.031	395	0.00130		N
		400	0.035	400	0.00149		T
		405	0.040	405	0.00170		
		410	0.046	410	0.00194		
		415	0.053	415	0.00222		
		420	0.061	420	0.00252		
		425	0.070	425	0.00287		
		430	0.080	430	0.00325		
		435	0.091	435	0.00369		
		440	0.103	440	0.00417		
		445	0.117	445	0.00471		

# DODECYL DIPHENYL ETHER DISULFONATE SOLUTION

DOS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dodecyl diphenyl ether sulfonate, disodium salt, aqueous solution Dowfax 2A1	Liquid	Light yellow to light brown solution	Disinfectant-type smell
<b>Keep people away. Avoid contact with liquid. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing, (including gloves). Notify local health and pollution control agencies. Protect water intakes.</b>			
<b>Fire</b>	Not flammable		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN LOW CONCENTRATIONS. Harmful if it enters local water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Dilute and disperse	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 43; Misc. Water Solutions <b>2.2 Formula:</b> (Na <sup>+</sup> ) <sub>2</sub> [C <sub>12</sub> H <sub>25</sub> C <sub>6</sub> H <sub>4</sub> (SO <sub>3</sub> ) <sub>2</sub> O in H <sub>2</sub> O <b>2.3 IMO/UN Designation:</b> Not Listed <b>2.4 DOT ID No.:</b> Not Listed <b>2.5 CAS Registry No.:</b> 25167-32-2 <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 51616
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Goggles, rubber gloves, approved mist respirator, protective clothing. <b>3.2 Symptoms Following Exposure:</b> EYES AND SKIN: The solution is corrosive and may cause irreversible damage to eyes and skin. INGESTION: Irritation of the mouth, esophagus, and stomach. Diarrhea, intestinal distention, and occasional vomiting. <b>3.3 Treatment of Exposure:</b> Call a physician. EYES AND SKIN: Flush eyes and skin with plenty of water for at least 30 minutes. Remove contaminated clothing and shoes. INGESTION: Give fluids and induce vomiting. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 700 mg/kg (rat) <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Excessive exposure may cause liver and kidney damage. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Currently not available <b>3.11 Liquid or Solid Characteristics:</b> Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:**  
Not flammable
- 4.2 Flammable Limits in Air:** Not pertinent
- 4.3 Fire Extinguishing Agents:** Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 Special Hazards of Combustion**  
**Products:** May generate fumes of SO<sub>2</sub> or H<sub>2</sub>S in fire
- 4.6 Behavior in Fire:** Organic portion may burn once water has evaporated. Use water to extinguish.
- 4.7 Auto Ignition Temperature:** Currently not available
- 4.8 Electrical Hazards:** Currently not available
- 4.9 Burning Rate:** Currently not available
- 4.10 Adiabatic Flame Temperature:** Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 Flame Temperature:** Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction
- 5.2 Reactivity with Common Materials:** No reaction
- 5.3 Stability During Transport:** Stable
- 5.4 Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute sodium bicarbonate or soda ash solution.
- 5.5 Polymerization:** Not pertinent
- 5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
Currently not available
- 6.2 Waterfowl Toxicity:** Currently not available
- 6.3 Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 Food Chain Concentration Potential:**  
Currently not available
- 6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Aqueous solution, 47% maximum concentration
- 7.2 Storage Temperature:** Currently not available
- 7.3 Inert Atmosphere:** None
- 7.4 Venting:** None
- 7.5 IMO Pollution Category:** A
- 7.6 Ship Type:** 2
- 7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed.
- 8.2 49 CFR Class:** Not pertinent
- 8.3 49 CFR Package Group:** Not listed.
- 8.4 Marine Pollutant:** No
- 8.5 NFPA Hazard Classification:** Not listed
- 8.6 EPA Reportable Quantity:** Not listed.
- 8.7 EPA Pollution Category:** Not listed.
- 8.8 RCRA Waste Number:** Not listed
- 8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid (water solution)
- 9.2 Molecular Weight:** 712.95
- 9.3 Boiling Point at 1 atm:** 212°F = 100°C = 373°K (approximate, varies with concentration)
- 9.4 Freezing Point:** 32°F = 0°C = 273°K (approximate, varies with concentration)
- 9.5 Critical Temperature:** Currently not available
- 9.6 Critical Pressure:** Currently not available
- 9.7 Specific Gravity:** 1.161 at 25°C
- 9.8 Liquid Surface Tension:** Currently not available
- 9.9 Liquid Water Interfacial Tension:** Not pertinent
- 9.10 Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 Latent Heat of Vaporization:** Currently not available
- 9.13 Heat of Combustion:** Currently not available
- 9.14 Heat of Decomposition:** Currently not available
- 9.15 Heat of Solution:** Currently not available
- 9.16 Heat of Polymerization:** Currently not available
- 9.17 Heat of Fusion:** Currently not available
- 9.18 Limiting Value:** Currently not available
- 9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# DODECYL DIPHENYL ETHER DISULFONATE SOLUTION

DOS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# 1,4-DIOXANE

DOX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Di(ethylene oxide) Dioxane p-Dioxane	Liquid  Colorless  Slight alcohol odor  Sinks and mixes with water. Flammable, irritating vapor is produced. Freezing point is 53°F.
<b>Keep people away. Avoid contact with liquid and vapor.</b> <b>Avoid inhalation.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, alcohol foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** Currently not available; Ether  
**2.2 Formula:** CH<sub>2</sub>CH<sub>2</sub>OCH<sub>2</sub>CH<sub>2</sub>O  
**2.3 IMO/UN Designation:** 3.2/1165  
**2.4 DOT ID No.:** 1165  
**2.5 CAS Registry No.:** 123-91-1  
**2.6 NAERG Guide No.:** 127  
**2.7 Standard Industrial Trade Classification:** 51569

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Fresh air mask; rubber gloves; goggles; safety shower and eye bath.  
**3.2 Symptoms Following Exposure:** No significant irritation from brief exposure of skin; prolonged or repeated exposure may cause a rash or burn and absorption of toxic amounts leading to serious injury of liver and kidney. Chemical has poor warning properties; illness may be delayed. Moderately irritating to eyes; overexposure may cause corneal injury.  
**3.3 Treatment of Exposure:** INHALATION: promptly remove victim to fresh air, keep him quiet and warm, and call physician; start artificial respiration if breathing stops. INGESTION: if large amounts are swallowed, quickly induce vomiting and get medical attention; no specific antidote known. SKIN AND EYES: flush with plenty of water for 15 min.; remove contaminated clothing and wash before reuse; get medical attention for eyes and if ill effects occur from skin contact.  
**3.4 TLV-TWA:** 25 ppm  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (guinea pig: 3.90 g/kg)  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Causes cancer in rats.  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentration. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
**3.12 Odor Threshold:** 620 mg/m<sup>3</sup>  
**3.13 IDLH Value:** 500 ppm  
**3.14 OSHA PEL-TWA:** 100 ppm  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 74°F O.C. 54°F C.C.  
**4.2 Flammable Limits in Air:** 1.97%-22.5% by vol.  
**4.3 Fire Extinguishing Agents:** Alcohol foam, carbon dioxide, dry chemical  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion Products:** Toxic vapors are generated when heated.  
**4.6 Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back.  
**4.7 Auto Ignition Temperature:** 356°F  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 23.8 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** 0% (theor.), 10 days  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Currently not available  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester) or pressure-vacuum  
**7.5 IMO Pollution Category:** D  
**7.6 Ship Type:** 2  
**7.7 Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid  
**8.2 49 CFR Class:** 3  
**8.3 49 CFR Package Group:** II  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	1

**8.6 EPA Reportable Quantity:** 100 pounds  
**8.7 EPA Pollution Category:** B  
**8.8 RCRA Waste Number:** U108  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 88.11  
**9.3 Boiling Point at 1 atm:** 214.3°F = 101.3°C = 374.5°K  
**9.4 Freezing Point:** 53.2°F = 11.8°C = 285.2°K  
**9.5 Critical Temperature:** 597.2°F = 314°C = 587.2°K  
**9.6 Critical Pressure:** 755 psia = 51.4 atm = 5.21 MN/m<sup>2</sup>  
**9.7 Specific Gravity:** 1.036 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** Not pertinent  
**9.9 Liquid Water Interfacial Tension:** Not pertinent  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** 1.1  
**9.12 Latent Heat of Vaporization:** 178 Btu/lb = 98.6 cal/g = 4.13 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -11,590 Btu/lb = -6440 cal/g = -269.6 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** 34.85 cal/g  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 1.4 psia

### NOTES



# 1,4-DIOXANE

DOX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	64.940	60	0.401	72	1.101	N O T  P E R T I N E N T	
70	64.520	70	0.405	74	1.098		
80	64.110	80	0.408	76	1.095		
90	63.690	90	0.411	78	1.092		
100	63.280	100	0.415	80	1.088		
110	62.860	110	0.418	82	1.085		
120	62.440	120	0.421	84	1.082		
130	62.030	130	0.425	86	1.078		
140	61.610	140	0.428	88	1.075		
150	61.200	150	0.431	90	1.072		
160	60.780	160	0.435	92	1.068		
170	60.360	170	0.438	94	1.065		
180	59.950	180	0.441	96	1.062		
190	59.530	190	0.445	98	1.059		
200	59.110	200	0.448	100	1.055		
210	58.700	210	0.451	102	1.052		
				104	1.049		
				106	1.045		
				108	1.042		
				110	1.039		
				112	1.035		
				114	1.032		
				116	1.029		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		60	0.411	60	0.00650	0	0.216
		70	0.553	70	0.00856	25	0.229
		80	0.734	80	0.01117	50	0.241
		90	0.965	90	0.01442	75	0.253
		100	1.257	100	0.01844	100	0.266
		110	1.622	110	0.02337	125	0.278
		120	2.074	120	0.02937	150	0.290
		130	2.631	130	0.03662	175	0.302
		140	3.310	140	0.04530	200	0.314
		150	4.133	150	0.05564	225	0.326
		160	5.124	160	0.06788	250	0.338
		170	6.310	170	0.08226	275	0.349
		180	7.720	180	0.09906	300	0.361
		190	9.386	190	0.11860	325	0.372
		200	11.340	200	0.14120	350	0.384
		210	13.630	210	0.16710	375	0.395
		220	16.300	220	0.19680	400	0.406
		230	19.380	230	0.23070	425	0.417
		240	22.930	240	0.26900	450	0.429
		250	27.010	250	0.31240	475	0.440
		260	31.670	260	0.36120	500	0.451
						525	0.461
						550	0.472
						575	0.483
						600	0.493

# DIBUTYL PHTHALATE

DPA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butyl phthalate DBP Phthalic acid, dibutyl ester RC plasticizer DBP Witicizer 300	Oily liquid  Colorless  Odorless  Sinks slowly in water.
Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide.
<b>Exposure</b>	LIQUID No appreciable harm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Ester  
2.2 Formula:  $O-C_4H_9[COO(CH_2)_4CH_3]_2$   
2.3 IMO/IUN Designation: Not listed  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 84-74-2  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Eye protection.  
3.2 Symptoms Following Exposure: Vapors from very hot material may irritate eyes and produce headache, drowsiness, and convulsions.  
3.3 Treatment of Exposure: Remove to fresh air. Wash affected skin areas with water. Flush eyes with water.  
3.4 TLV-TWA: 5 mg/m<sup>3</sup>  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 1; LD<sub>50</sub> = 5 to 15 g/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Birth defects in rats; polyneuritis in humans  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 4,000 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 5 mg/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 355°F O.C. 315°F C.C.  
4.2 Flammable Limits in Air: 0.5%-2.5% (calculated)  
4.3 Fire Extinguishing Agents: Dry powder, carbon dioxide, foam  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 757°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 92.8 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 27.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 1230 ppm/24 hr/bluegill/TL<sub>m</sub>/fresh water  
6.2 Waterfowl Toxicity: LC<sub>50</sub> > 5000 ppm  
6.3 Biological Oxygen Demand (BOD): 0.43lb/lb, 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99.6%  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: A  
7.6 Ship Type: 2  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: U069  
8.9 EPA FWPCL List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 278.35  
9.3 Boiling Point at 1 atm: 635°F = 335°C = 608°K  
9.4 Freezing Point: -31°F = -35°C = 238°K  
9.5 Critical Temperature: 932.0°F = 500°C = 773.2°K  
9.6 Critical Pressure: 250 psia = 17 atm = 1.7 MN/m<sup>2</sup>  
9.7 Specific Gravity: 1.049 at 20°C (liquid)  
9.8 Liquid Surface Tension: 34 dynes/cm = 0.034 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: 27 dynes/cm = 0.027 N/m at 22.7°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: -13,300 Btu/lb = -7400 cal/g = -310 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# DIBUTYL PHTHALATE

DPA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	66.309	32	0.430	45	0.956	55	24.790
50	66.020	34	0.430	50	0.954	60	22.770
60	65.730	36	0.430	55	0.952	65	20.950
70	65.440	38	0.430	60	0.949	70	19.310
80	65.139	40	0.430	65	0.947	75	17.820
90	64.849	42	0.430	70	0.945	80	16.470
100	64.559	44	0.430	75	0.943	85	15.250
110	64.270	46	0.430	80	0.941	90	14.140
120	63.980	48	0.430	85	0.939	95	13.120
130	63.690	50	0.430	90	0.937	100	12.200
140	63.400	52	0.430	95	0.934	105	11.350
150	63.100	54	0.430	100	0.932	110	10.580
160	62.810	56	0.430	105	0.930	115	9.870
170	62.520	58	0.430	110	0.928	120	9.220
180	62.230	60	0.430	115	0.926		
190	61.940	62	0.430	120	0.924		
200	61.650	64	0.430	125	0.921		
210	61.360	66	0.430	130	0.919		
		68	0.430	135	0.917		
		70	0.430	140	0.915		
				145	0.913		
				150	0.911		
				155	0.908		
				160	0.906		
				165	0.904		
				170	0.902		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	220	0.001	220	0.00003		N
	N	230	0.001	230	0.00005		O
	S	240	0.002	240	0.00008		T
	O	250	0.003	250	0.00011		
	L	260	0.004	260	0.00016		P
	U	270	0.006	270	0.00023		E
	B	280	0.009	280	0.00032		R
	I	290	0.013	290	0.00045		T
	E	300	0.018	300	0.00062		I
		310	0.025	310	0.00086		N
		320	0.035	320	0.00117		E
		330	0.048	330	0.00158		N
		340	0.066	340	0.00213		T
		350	0.089	350	0.00284		
		360	0.119	360	0.00376		
		370	0.158	370	0.00494		
		380	0.209	380	0.00646		
		390	0.274	390	0.00838		

# 1,1-DICHLOROPROPANE

DPB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Propane, 1,1-dichloro- Propylene chloride	Watery liquid Colorless Sweet odor
Sinks in water. Flammable, irritating vapor is produced.	
Keep people away. Avoid inhalation. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 36; Halogenated hydrocarbon  
2.2 Formula:  $C_3H_5CHCl_2$   
2.3 IMO/UN Designation: 3.2/1279  
2.4 DOT ID No.: 1279  
2.5 CAS Registry No.: 78-99-9  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51138

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, self-contained breathing apparatus, coveralls or laboratory coat.  
3.2 **Symptoms Following Exposure:** INHALATION: May cause some central nervous system depression. EYES: May cause some pain and irritation. SKIN: Mild irritation.  
3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. EYES: Flush with running water for 15 minutes. SKIN: Wash thoroughly with soap and water. INGESTION: Gastric lavage or emesis and catharsis.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1;  $LD_{50} = 5$  to 15 g/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** (est.) 60°F O.C.; 70°F C.C.  
4.2 **Flammable Limits in Air:** (est.) 3.4% - 14.5%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Emits fumes of phosgene  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** (est.) 1035°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 19.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** (est.) Threshold range 1 to 100 ppm.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 0  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 112.99  
9.3 **Boiling Point at 1 atm:** 190.6°F = 88.1°C = 361.3°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** (est.) 511°F = 266.1°C = 539.25°K  
9.6 **Critical Pressure:** (est.) 563 psia = 38.3 atm = 3.88 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.1321 at 20°C  
9.8 **Liquid Surface Tension:** (est.) 26.1 dynes/cm = 0.0261 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 46.9 dynes/cm = 0.0469 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.90  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.094 at 20°C (68°F)  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** (est.) -6667 Btu/lb = -3704 cal/g = -155 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1,1-DICHLOROPROPANE

DPB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	71.337		C		C		C
52	71.261		U		U		U
54	71.183		R		R		R
56	71.108		R		R		R
58	71.030		E		E		E
60	70.955		N		N		N
62	70.877		T		T		T
64	70.801		L		L		L
66	70.724		Y		Y		Y
68	70.648						
70	70.572		N		N		N
72	70.495		O		O		O
74	70.419		T		T		T
76	70.342						
			A		A		A
			V		V		V
			A		A		A
			I		I		I
			L		L		L
			A		A		A
			B		B		B
			L		L		L
			L		L		L
			E		E		E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	-40	-1.111	20	0.00543	1350	0.390
	N	-30	-1.702	30	0.00698	1375	0.392
	S	-20	-0.293	40	0.00897	1400	0.393
	O	-10	-0.884	50	0.01154	1425	0.395
	L	0	0.525	60	0.01483	1450	0.397
	U	10	0.065	70	0.01907	1475	0.398
	B	20	0.656	80	0.02451	1500	0.400
	L	30	1.247	90	0.03151	1525	0.401
	E	40	1.838	100	0.04051	1550	0.403
		50	2.428	110	0.05207	1575	0.404
		60	3.019	120	0.06694	1600	0.405
		70	3.610	130	0.08605	1625	0.407
		80	4.201	140	0.11063	1650	0.408
		90	4.791			1675	0.410
		100	5.382			1700	0.411
		110	5.973			1725	0.412
		120	6.564			1750	0.414
		130	7.155			1775	0.415
		140	7.745			1800	0.416
		150	8.336			1825	0.418
		160	8.927			1850	0.419
		170	9.518			1875	0.420
		180	10.108			1900	0.421
		190	10.699			1925	0.423
						1950	0.424
						1975	0.425

# 1,3-DICHLOROPROPANE

DPC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Trimethylene chloride Trimethylene dichloride	Watery liquid	Colorless	Sweet odor
Sinks in water. Flammable, irritating vapor is produced.			
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_2\text{ClCH}_2\text{CH}_2\text{Cl}$   
2.3 IMO/UN Designation: 3.2/1279  
2.4 DOT ID No.: 1279  
2.5 CAS Registry No.: 142-28-9  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51138

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, self-contained breathing apparatus, coveralls or laboratory coat.  
3.2 **Symptoms Following Exposure:** INHALATION: May cause some central nervous system depression. EYES: May cause some pain and irritation. SKIN: Mild irritation.  
3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. EYES: Flush with running water for 15 minutes. SKIN: Wash thoroughly with soap and water. INGESTION: Gastric lavage or emesis and catharsis.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Alters pancreatic function.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
(est.) 60°F O.C.: 70°F C.C.  
4.2 **Flammable Limits in Air:** (est.) 3.4%-14.5%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Emits fumes of phosgene.  
4.6 **Behavior in Fire:** Reacts vigorously.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 19.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
(est.) Threshold range 1 to 100 ppm.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U084  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 112.99  
9.3 **Boiling Point at 1 atm:** 248.7°F = 120.4°C = 393.6°K  
9.4 **Freezing Point:** -147.1°F = -99.5°C = 173.7°K  
9.5 **Critical Temperature:** (est.) 597.8°F = 314.3°C = 587.5°K  
9.6 **Critical Pressure:** (est.) 613.7 psia = 41.75 atm = 4.23 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.1878 at 20°C  
9.8 **Liquid Surface Tension:** 33.93 dynes/cm = 0.03393 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 41.1 dynes/cm = 0.0411 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.90.  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.094 at 20°C (68°F)  
9.12 **Latent Heat of Vaporization:** At boiling point, 129 Btu/lb = 71.71 cal/g = 3.0 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -6676 Btu/lb = -3709 cal/g = -155 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1,3-DICHLOROPROPANE

DPC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
59	74.969		C		C		C
60	74.853		U		U		U
61	74.740		R		R		R
62	74.629		R		R		R
63	74.523		E		E		E
64	74.421		N		N		N
65	74.320		T		T		T
66	74.224		L		L		L
67	74.131		Y		Y		Y
68	74.040		N		N		N
			O		O		O
			T		T		T
			A		A		A
			V		V		V
			A		A		A
			I		I		I
			L		L		L
			A		A		A
			B		B		B
			L		L		L
			L		L		L
			E		E		E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	0	-1.071	40	0.02206	1000	0.381
	N	10	-1.664	50	0.01194	1025	0.385
	S	20	-0.257	60	0.00182	1050	0.390
	O	30	-0.850	70	0.00830	1075	0.394
	L	40	0.557	80	0.01842	1100	0.398
	U	50	0.036	90	0.02854	1125	0.403
	B	60	0.629	100	0.03896	1150	0.407
	L	70	1.222	110	0.04878	1175	0.412
	E	80	1.815	120	0.05890	1200	0.416
		90	2.408	130	0.06902	1225	0.421
		100	3.000	140	0.07915	1250	0.425
		110	3.593	150	0.08927	1275	0.429
		120	4.186	160	0.09939	1300	0.434
		130	4.779	170	0.10951	1325	0.438
		140	5.372	180	0.11963	1350	0.443
		150	5.965	190	0.12975	1375	0.447
		160	6.558	200	0.13987	1400	0.452
		170	7.151	210	0.14999	1425	0.456
		180	7.744	220	0.16011	1450	0.460
		190	8.337	230	0.17023	1475	0.465
		200	8.930	240	0.18035	1500	0.469
		210	9.522			1525	0.474
		220	10.115			1550	0.478
		230	10.708			1575	0.483
		240	11.301			1600	0.487
						1625	0.492

# DIPHENYLDICHLOROSILANE

DPD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dichlorodiphenylsilane Dichlorodiphenylsilicane Diphenylsilicon dichloride	Liquid  Colorless  Sharp, irritating odor  Reacts with water. Irritating vapor is produced.
Keep people away. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (C<sub>6</sub>H<sub>5</sub>)<sub>2</sub>SiCl<sub>2</sub>  
2.3 IMO/UN Designation: 8/1769  
2.4 DOT ID No.: 1769  
2.5 CAS Registry No.: 80-10-4  
2.6 NAERG Guide No.: 156  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Acid-vapor-type respiratory protection; rubber gloves; chemical worker's goggles; other protective equipment as necessary to protect skin and eyes.
- 3.2 **Symptoms Following Exposure:** Inhalation irritates mucous membranes. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; support respiration; call physician if needed. EYES: flush with water for 15 min.; obtain medical attention immediately. SKIN: flush with water; obtain medical attention for acid burns. INGESTION: give large amounts of water, if victim is conscious; give milk, or milk of magnesia; call physician.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and-third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 288°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water and foam  
4.5 **Special Hazards of Combustion Products:** Hydrochloric acid and phosgene fumes may be formed.  
4.6 **Behavior in Fire:** Difficult to extinguish; re-ignition may occur. Contact with water or foam applied to adjacent fires will produce irritating hydrogen chloride fumes.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 2.7 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 71.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 19.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with water to generate hydrogen chloride (hydrochloric acid).  
5.2 **Reactivity with Common Materials:** Reacts with surface moisture to generate hydrogen chloride, which is corrosive to common metals.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: I  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 96+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 253  
9.3 **Boiling Point at 1 atm:** 579°F = 304°C = 577°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.22 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 106 Btu/lb = 59 cal/g 2.5 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -11,000 Btu/lb = -6,200 cal/g = -260 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# DIPHENYLDICHLOROSILANE

DPD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	76.709	52	0.400	52	0.783	52	8.773
54	76.639	54	0.400	54	0.783	54	8.305
56	76.570	56	0.400	56	0.783	56	7.865
58	76.500	58	0.400	58	0.783	58	7.452
60	76.429	60	0.400	60	0.783	60	7.064
62	76.360	62	0.400	62	0.783	62	6.699
64	76.290	64	0.400	64	0.783	64	6.355
66	76.219	66	0.400	66	0.783	66	6.031
68	76.150	68	0.400	68	0.783	68	5.726
70	76.089	70	0.400	70	0.783	70	5.438
72	76.020	72	0.400	72	0.783	72	5.167
74	75.950	74	0.400	74	0.783	74	4.911
76	75.879	76	0.400	76	0.783	76	4.670
78	75.809	78	0.400	78	0.783	78	4.442
80	75.740	80	0.400	80	0.783	80	4.227
82	75.669	82	0.400	82	0.783	82	4.024
84	75.599	84	0.400	84	0.783	84	3.832
86	75.530	86	0.400	86	0.783	86	3.650
				88	0.783		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	400	1.014	400	0.02779		N
	E	410	1.211	410	0.03282		O
	A	420	1.441	420	0.03862		T
	C	430	1.709	430	0.04527		
	T	440	2.018	440	0.05287		P
	S	450	2.375	450	0.06153		E
		460	2.785	460	0.07136		R
		470	3.254	470	0.08249		T
		480	3.790	480	0.09505		I
		490	4.399	490	0.10920		N
		500	5.092	500	0.12500		E
		510	5.875	510	0.14280		N
		520	6.759	520	0.16260		T
		530	7.754	530	0.18470		
		540	8.871	540	0.20910		
		550	10.120	550	0.23630		
		560	11.520	560	0.26630		
		570	13.080	570	0.29930		

# DIPHENYL ETHER

DPE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diphenyl oxide Phenoxybenzene Phenyl ether	Liquid  Colorless  Mild pleasant odor
May float or sink in water. Freezing point is 81°F.	
Shut off ignition sources. Call fire department. Keep people away. Call fire department. Avoid contact with liquid and solid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals or carbon dioxide. Water and foam may be ineffective on fire.
<b>Exposure</b>	Call for medical aid.  LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{12}H_{10}O$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 101-84-8  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Inhalation may cause nausea because of disagreeable odor.  
Contact of liquid with eyes causes mild irritation. Prolonged exposure of skin to liquid causes reddening and irritation. Ingestion produces nausea.  
3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: induce vomiting and get medical attention.  
3.4 **TLV-TWA:** 1 ppm  
3.5 **TLV-STEL:** 2 ppm  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $LD_{50}$  = 3,370 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** 0.1 ppm  
3.13 **IDLH Value:** 100 ppm  
3.14 **OSHA PEL-TWA:** 1 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 239°F C.C.  
4.2 **Flammable Limits in Air:** 0.8%-1.5%  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 1,148°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 3.2 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 66.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 17.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Pure grade; Technical grade; Perfume grade  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 170.2  
9.3 **Boiling Point at 1 atm:** 495°F = 257°C = 530°K  
9.4 **Freezing Point:** 81°F = 27°C = 300°K  
9.5 **Critical Temperature:** 921.2°F = 494°C = 767.2°K  
9.6 **Critical Pressure:** 478 psia = 32.5 atm = 3.30 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.07 at 27°C (liquid)  
9.8 **Liquid Surface Tension:** 40.05 dynes/cm = 0.0401 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 36 dynes/cm = 0.036 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 130 Btu/lb = 72 cal/g = 3.0 X 10<sup>4</sup> J/kg  
9.13 **Heat of Combustion:** -15,520 Btu/lb = -8,620 cal/g = -361 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

### NOTES

# DIPHENYL ETHER

DPE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
81	66.509	81	0.460	85	0.873		C U R R E N T L Y  N O T  A V A I L A B L E
82	66.480	82	0.460	90	0.870		
83	66.450	83	0.460	95	0.866		
84	66.419	84	0.460	100	0.863		
85	66.389	85	0.460	105	0.859		
86	66.349	86	0.460	110	0.856		
87	66.320	87	0.460	115	0.852		
88	66.290	88	0.460	120	0.849		
89	66.259	89	0.460	125	0.845		
90	66.230	90	0.460	130	0.842		
91	66.200	91	0.460	135	0.838		
92	66.169	92	0.460	140	0.835		
93	66.139	93	0.460	145	0.831		
94	66.110	94	0.460	150	0.828		
95	66.070	95	0.460	155	0.824		
				160	0.821		
				165	0.818		
				170	0.814		
				175	0.811		
				180	0.807		
				185	0.804		
				190	0.800		
				195	0.797		
				200	0.793		
				205	0.790		
				210	0.786		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	310	0.887	310	0.01828		N O T  P E R T I N E N T
		320	1.069	320	0.02173		
		330	1.281	330	0.02572		
		340	1.529	340	0.03032		
		350	1.817	350	0.03558		
		360	2.150	360	0.04159		
		370	2.534	370	0.04842		
		380	2.974	380	0.05617		
		390	3.478	390	0.06491		
		400	4.053	400	0.07475		
		410	4.706	410	0.08580		
		420	5.446	420	0.09816		
		430	6.281	430	0.11190		
		440	7.222	440	0.12730		
		450	8.278	450	0.14430		
		460	9.460	460	0.16310		
		470	10.780	470	0.18390		
		480	12.250	480	0.20670		
		490	13.880	490	0.23180		

# 2,3-DICHLOROPROPENE

DPF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Chloroallyl chloride 2,3-Dichloro-1-propane 2,3-Dichloropropylene	Liquid  Colorless to yellow  Chloroform  Sinks in water. Flammable, irritating vapor is produced.
Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID. Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing, except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: CH <sub>2</sub> CClCH <sub>2</sub> Cl 2.3 IMO/UN Designation: 3.2/2047 2.4 DOT ID No.: 2047 2.5 CAS Registry No.: 78-88-6 2.6 NAERG Guide No.: 132 2.7 Standard Industrial Trade Classification: 51138
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Rubber gloves, self-contained breathing apparatus, protective clothing. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Vapors are poisonous, painful and irritating. Headache and dizziness may occur. Overexposure may cause liver and kidney damage and even death. EYES: Irritation and lacrimation. May cause transient corneal injury. SKIN: Slight irritation, readily absorbed in toxic amounts causing headache and dizziness and other systematic symptoms. INGESTION: Acute gastrointestinal distress with pulmonary congestion and edema. CNS Depression. 3.3 <b>Treatment of Exposure:</b> INHALATION: Get medical aid. Remove from exposure. Administer oxygen to relieve cyanosis and pulmonary edema. If respiration stops give mouth- to-mouth resuscitation. EYES: Flush with water for 15 min. SKIN: Remove and discard contaminated clothing. Wash contaminated skin with soap and water. INGESTION: Remove gastric aspiration and lavage. Use water as lavage fluid. Demulcents like alumina gels. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; LD <sub>50</sub> = 50 to 500 mg/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Mutagenic, can injure liver, kidneys and heart. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations. 3.11 <b>Liquid or Solid Characteristics:</b> Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 59-62°F C.C.
- 4.2 **Flammable Limits in Air:** 2.6%-7.8%.
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical or CO<sub>2</sub>. Large fires: water fog or spray, or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** None noted.
- 4.5 **Special Hazards of Combustion Products:** Highly toxic vapors.
- 4.6 **Behavior in Fire:** Emits highly toxic vapors.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 16.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Reacts with aluminum, amines and ammonia.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Will not occur.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 10-100 ppm/96 hr/finfish/TL<sub>50</sub> 40 ppm/fish toxicity/critical concentration
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98% minimum.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 110.98
- 9.3 **Boiling Point at 1 atm:** 196–201°F = 92–94°C = 364.2–366.2°K.
- 9.4 **Freezing Point:** –115°F = –81.7°C = 191.5°K.
- 9.5 **Critical Temperature:** (est.) 526.7°F = 274.8°C = 548°K.
- 9.6 **Critical Pressure:** (est.) 513 psia = 34.9 atm = 3.54 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.211 at 20°C/4°C
- 9.8 **Liquid Surface Tension:** (Calculated) 29.9 dynes/cm = 0.029 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (Calculated) 45.1 dynes/cm = 0.0451 N/m at 20°C.
- 9.10 **Vapor (Gas) Specific Gravity:** 3.8.
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) Approx. 1.116 at 20°C
- 9.12 **Latent Heat of Vaporization:** 137.1 Btu/lb = 76.1 cal/g = 3.19 X 10<sup>5</sup> J/kg.
- 9.13 **Heat of Combustion:** (est.) –6900 Btu/lb = –3900 cal/g = –160 X 10<sup>3</sup> J/kg.
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# 2,3-DICHLOROPROPENE

DPF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	75.599		C		C		C
69	75.525		U		U		U
70	75.452		R		R		R
71	75.379		R		R		R
72	75.304		E		E		E
73	75.231		N		N		N
74	75.158		T		T		T
75	75.085		L		L		L
76	75.013		Y		Y		Y
77	74.940		N		N		N
			O		O		O
			T		T		T
			A		A		A
			V		V		V
			A		A		A
			I		I		I
			L		L		L
			A		A		A
			B		B		B
			L		L		L
			E		E		E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	-30	-1.216	40	0.00897		C
	N	-20	-1.767	50	0.00601		U
	S	-10	-0.317	60	0.00305		R
	O	0	-0.868	70	-0.00008		R
	L	10	0.582	80	0.00288		E
	U	20	0.031	90	0.00584		N
	B	30	0.519	100	0.00881		T
	L	40	1.069	110	0.01177		L
	E	50	1.620	120	0.01473		Y
		60	2.170	130	0.01769		N
		70	2.721	140	0.02066		O
		80	3.271	150	0.02362		T
		90	3.822	160	0.02658		A
		100	4.372	170	0.02955		V
		110	4.922	180	0.03251		A
		120	5.473	190	0.03547		I
		130	6.023	200	0.03844		L
		140	6.574	210	0.04140		A
		150	7.124				B
		160	7.675				L
		170	8.225				E
		180	8.776				
		190	9.326				
		200	9.876				

# DIPROPYLENE GLYCOL

DPG

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Thick liquid	Colorless	Odorless
	Sinks and mixes with water.		
Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
Fire	Combustible. Extinguish with water, dry chemical, alcohol foam, or carbon dioxide.		
Exposure	CALL FOR MEDICAL AID.  LIQUID Irritating to eyes. IF IN EYES, hold eyelids open and flush with plenty of water.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ether
- 2.2 Formula:  $(\text{CH}_3\text{CHOHCH}_2)_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 110-98-5
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Safety glasses with side shields or goggles; shower and eye bath.
- 3.2 Symptoms Following Exposure: Minor eye irritation
- 3.3 Treatment of Exposure: EYES: irrigate briefly with water; if any ill effects, get medical attention.  
SKIN & INGESTION: if any ill effects develop, get medical attention.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 1;  $\text{LD}_{50}$  = 5 to 15 g/kg (rat)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Nonirritating to the eyes and throat.
- 3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 280°F O.C.
- 4.2 Flammable Limits in Air: LFL = 2.2% (approx.)
- 4.3 Fire Extinguishing Agents: Water fog, alcohol foam, carbon dioxide, dry chemical
- 4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: 2.0 mm/min.
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 38.1 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 13.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 0
  - Human Oral hazard: 0
  - Human Contact hazard: 0
  - Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial: 99%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open (flame arrester)
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 134.17
- 9.3 Boiling Point at 1 atm: 420°F = .232°C = 505°K
- 9.4 Freezing Point: >-40°F = >-40°C = >233°K
- 9.5 Critical Temperature: 719.6°F = 382°C = 655.2°K
- 9.6 Critical Pressure: 529 psia = 36 atm = 3.6 MN/m<sup>2</sup>
- 9.7 Specific Gravity: 1.023 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): 1.0
- 9.12 Latent Heat of Vaporization: 170 Btu/lb = 96 cal/g =  $4.0 \times 10^5$  J/kg
- 9.13 Heat of Combustion: -11,650 Btu/lb = -6470 cal/g =  $-271 \times 10^5$  J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: (est.) -13 Btu/lb = -7 cal/g =  $-0.3 \times 10^5$  J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Very low

### NOTES

# DIPROPYLENE GLYCOL

DPG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	64.589	40	0.558	30	1.109		N O T  P E R T I N E N T
50	64.339	50	0.564	40	1.109		
60	64.089	60	0.570	50	1.109		
70	63.830	70	0.576	60	1.109		
80	63.580	80	0.582	70	1.109		
90	63.330	90	0.588	80	1.109		
100	63.070	100	0.594	90	1.109		
110	62.820	110	0.601	100	1.109		
120	62.570	120	0.607	110	1.109		
130	62.310	130	0.613	120	1.109		
140	62.060	140	0.619	130	1.109		
150	61.810	150	0.625	140	1.109		
160	61.550	160	0.631	150	1.109		
170	61.300	170	0.637	160	1.109		
180	61.050	180	0.643	170	1.109		
190	60.790	190	0.649	180	1.109		
200	60.540	200	0.656	190	1.109		
210	60.290	210	0.662	200	1.109		
		220	0.668				
		230	0.674				
		240	0.680				
		250	0.686				
		260	0.692				
		270	0.698				
		280	0.704				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		70	0.001	70	0.00004	0	0.329
		80	0.002	80	0.00005	25	0.340
		90	0.003	90	0.00007	50	0.351
		100	0.004	100	0.00010	75	0.362
		110	0.006	110	0.00013	100	0.373
		120	0.008	120	0.00018	125	0.384
		130	0.011	130	0.00024	150	0.394
		140	0.015	140	0.00032	175	0.404
		150	0.020	150	0.00042	200	0.414
		160	0.027	160	0.00054	225	0.424
		170	0.035	170	0.00070	250	0.434
		180	0.046	180	0.00089	275	0.443
		190	0.059	190	0.00114	300	0.452
		200	0.075	200	0.00143	325	0.461
		210	0.096	210	0.00179	350	0.470
		220	0.121	220	0.00222	375	0.479
		230	0.151	230	0.00274	400	0.487
		240	0.188	240	0.00336	425	0.496
		250	0.233	250	0.00410	450	0.504
		260	0.286	260	0.00497	475	0.512
		270	0.350	270	0.00600	500	0.520
		280	0.426	280	0.00719	525	0.527
		290	0.515	290	0.00859	550	0.535
		300	0.620	300	0.01020	575	0.542
						600	0.550

# DIETHYL PHTHALATE

DPH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Benzenedicarboxylic acid, diethyl ester Ethyl phthalate Phthalic acid, diethyl ester	Liquid  White   Mild chemical odor   Sinks in water. Freezing point is 27°F.
Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Irritating gases may be produced when heated. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	LIQUID Not harmful.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_8H_{10}(COOC_2H_5)_2$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 84-66-2
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Rubber gloves; goggles or face shield
- 3.2 Symptoms Following Exposure: Symptoms unlikely from any form of exposure.
- 3.3 Treatment of Exposure: INHALATION: remove to fresh air. EYES: flush with water. SKIN: flush with water, wash well with soap and water.
- 3.4 TLV-TWA: 5mg/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; oral LD<sub>50</sub> = 1,000 mg/kg (rabbit)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Prolonged inhalation of heated vapor produces irritation of upper respiratory tract in humans
- 3.10 Vapor (Gas) Irritant Characteristics: Odorless
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 305°F O.C.
- 4.2 Flammable Limits in Air: LFL 0.75% (at 368°F)
- 4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.
- 4.5 Special Hazards of Combustion Products: Irritating vapors of unburned chemical may form in fire.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: 855°F
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 64.3 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 19.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical; 99+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: C
- 7.6 Ship Type: 3
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: U088
- 8.9 EPA FWPCA List: Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: May attack some forms of plastics.
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 222
- 9.3 Boiling Point at 1 atm: 569.3°F = 298.5°C = 571.7°K
- 9.4 Freezing Point: 27°F = -3°C = 270°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.12 at 20°C (liquid)
- 9.8 Liquid Surface Tension: 37.5 dynes/cm = 0.0375 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension: 16.27 dynes/cm = 0.01627 N/m at 20.5°C
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: 170 Btu/lb = 96 cal/g = 4.0 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: -10,920 Btu/lb = -6,070 cal/g = -254 X 10<sup>5</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 1.2 ppm/30 min/goldfish/killed/fresh water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 2
  - Human Oral hazard: 1
  - Human Contact hazard: II
  - Reduction of amenities: X

### NOTES



# DIETHYL PHTHALATE

DPH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
51	69.910	N O T  P E R T I N E N T	N O T  P E R T I N E N T	30	1.010	34	32.400
52	69.910			40	1.006	36	30.450
53	69.910			50	1.001	38	28.630
54	69.910			60	0.997	40	26.930
55	69.910			70	0.992	42	25.340
56	69.910			80	0.988	44	23.860
57	69.910			90	0.984	46	22.480
58	69.910			100	0.979	48	21.180
59	69.910			110	0.975	50	19.980
60	69.910			120	0.970	52	18.840
61	69.910			130	0.966	54	17.780
62	69.910			140	0.961	56	16.790
63	69.910			150	0.957	58	15.860
64	69.910			160	0.953	60	14.990
65	69.910			170	0.948	62	14.170
66	69.910			180	0.944	64	13.400
67	69.910			190	0.939	66	12.680
68	69.910			200	0.935	68	12.010
69	69.910					70	11.370
70	69.910					72	10.770
71	69.910					74	10.210
72	69.910					76	9.682
73	69.910						
74	69.910						
75	69.910						
76	69.910						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.012		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DIMETHYL HYDROGEN PHOSPHITE

DPI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dimethyl phosphite Dimethylphosphonate NCI-C54773 Phosphonic acid, dimethyl ester	Liquid  Colorless
<b>Keep people away.</b> <b>Avoid contact with liquid and vapor.</b> <b>Wear self-contained breathing apparatus and protective clothing.</b> <b>Call fire department. Restrict ignition sources.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	COMBUSTIBLE. Water may be ineffective on fire. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed container with water.
<b>Exposure</b>	CALL FOR MEDICAL HELP  VAPOR Harmful if inhaled. Move to fresh air. If breathing has stopped give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if absorbed through skin or swallowed. Remove contaminated clothing. Flush affected area with soap and plenty of water. IF IN EYES, hold eyelids open and flush with water for 15 minutes.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify health and wildlife officials Notify operators of nearby water intakes

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 34; Esters <b>2.2 Formula:</b> (CH <sub>3</sub> O) <sub>2</sub> P(O)H <b>2.3 IMO/UN Designation:</b> Currently not available <b>2.4 DOT ID No.:</b> Not listed <b>2.5 CAS Registry No.:</b> 868-85-9 <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 51631
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Self-contained breathing apparatus, rubber boots and heavy rubber gloves <b>3.2 Symptoms Following Exposure:</b> Harmful if swallowed, inhaled or absorbed through skin. Exposure can cause nausea, headache and vomiting. Vapor irritating to eyes, mucous membrane and upper respiratory tract. <b>3.3 Treatment of Exposure:</b> INHALATION: Call for medical help. Remove victim to fresh air. If breathing has stopped give artificial respiration. If breathing is difficult, give oxygen. SKIN: Wash with soap and plenty of water. EYES: Wash with plenty of water. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 3.05 g/kg rat <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Suspected tumorigen and may be mutagen. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations. <b>3.11 Liquid or Solid Characteristics:</b> Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 85°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Water fog, dry chemical, carbon dioxide, alcohol foam.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
**4.5 Special Hazards of Combustion Products:** Emits toxic fumes under fire conditions.  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 16.7 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Dry lime, soda ash  
**5.5 Polymerization:** Will not occur  
**5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 99%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** (B)  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed.  
**8.2 49 CFR Class:** Not pertinent.  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 110.05  
**9.3 Boiling Point at 1 atm:** 338°-339.8°F = 170-171°C = 443.2-444.2°K  
**9.4 Freezing Point:** Currently not available  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 1.200  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** 3.79  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# DIMETHYL HYDROGEN PHOSPHITE

DPI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# DIPHENYLMETHANE DIISOCYANATE

DPM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carwinate 125 M Diphenylmethane-4,4'-diisocyanate Hylene M50 MDI Mltrathane M Nacconate 300 Vilrathane 4300	Solid  White to light yellow  Sinks in water.
<b>Keep people away. Avoid contact with solid and dust. Avoid inhalation. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Wear goggles and self-contained breathing apparatus. Extinguish with foam, dry chemical or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 12; Isocyanate  
2.2 Formula: (p-OCNC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>CH<sub>2</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2489  
2.5 CAS Registry No.: 101-68-8  
2.6 NAERG Guide No.: 156  
2.7 Standard Industrial Trade Classification: 51489

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved mask or respirator; clean rubber gloves; chemical goggles; clean waterproof or freshly laundered protective clothing (coveralls, rubber boots, cap, etc.).
- 3.2 **Symptoms Following Exposure:** Breathlessness, chest discomfort, and reduced pulmonary function.
- 3.3 **Treatment of Exposure:** INHALATION: treat symptomatically; vaso-dilators; oxygen. Call a physician. SKIN CONTACT: wash with soap and water. Rubbing alcohol helpful. EYE CONTACT: flush with water at least 15 min. Call a physician.
- 3.4 **TLV-TWA:** 0.005 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Severe irritation of eyes and throat; can cause eye and lung injury. Cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 75 mg/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** 0.02 ppm
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 425°F O.C.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical or foam
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic vapors are generated when heated.
- 4.6 **Behavior in Fire:** Solid melts and burns
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 88.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 22.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Slow, non-hazardous. Forms carbon dioxide gas.
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** May occur slowly. Is not hazardous.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Solid grades: 91-99%; liquid grades may contain 50% o-dichlorobenzene
- 7.2 **Storage Temperature:** 0° -40°F
- 7.3 **Inert Atmosphere:** Not pertinent
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 250.3
- 9.3 **Boiling Point at 1 atm:** 738°F = 392°C = 665°K
- 9.4 **Freezing Point:** 100°F = 37.7°C = 311°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.2 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Very low

### NOTES

# DIPHENYLMETHANE DIISOCYANATE

DPM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T	100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210	6.620 6.205 5.822 5.469 5.143 4.841 4.562 4.303 4.063 3.840 3.632 3.439 3.259 3.091 2.934 2.787 2.650 2.522 2.401 2.289 2.183 2.083 1.989

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DIPENTENE

DPN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> delta-1,8-Terpodiene Limonene p-Mentha-1,8-diene Phellandrene Terpinene	Liquid  Colorless to light yellow  Pleasant lemon-like odor  Floats on water.
Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Containers may explode in fire. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{10}H_{16}$   
2.3 IMO/UN Designation: 3.3/2052  
2.4 DOT ID No.: 2052  
2.5 CAS Registry No.: 138-86-3  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Solvent-resistant gloves; safety glasses or face shield; self-contained breathing apparatus for high vapor concentrations.
- 3.2 **Symptoms Following Exposure:** Liquid irritates eyes; prolonged contact with skin causes irritation. Ingestion causes irritation of gastrointestinal tract.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from contaminated area; administer artificial respiration if necessary; call physician. EYES: flush with water for 15 min.; call physician. SKIN: wash with soap and water. INGESTION: induce vomiting; call physician.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral  $LD_{50}$  = 4,600 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 115°F C.C.
- 4.2 **Flammable Limits in Air:** 0.7%-6.1%
- 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode.
- 4.7 **Auto Ignition Temperature:** 458°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 5.5 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 66.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 4  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Several technical grades, all having same general properties.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 136.2
- 9.3 **Boiling Point at 1 atm:** 352°F = 178°C = 451°K
- 9.4 **Freezing Point:** -40°F = -40°C = 233°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.842 at 21°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** 27.45 dynes/cm = 0.02745 N/m at 33.5°C
- 9.10 **Vapor (Gas) Specific Gravity:** 4.9
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** 140 Btu/lb = 77 cal/g =  $3.2 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** -19,520 Btu/lb = -10,840 cal/g =  $-454 \times 10^5$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIPENTENE

DPN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
32	53.740	34	0.421	52	1.048	34	1.468
34	53.670	36	0.422	54	1.048	36	1.423
36	53.600	38	0.423	56	1.048	38	1.380
38	53.530	40	0.424	58	1.048	40	1.339
40	53.460	42	0.426	60	1.048	42	1.299
42	53.390	44	0.427	62	1.048	44	1.261
44	53.320	46	0.428	64	1.048	46	1.224
46	53.250	48	0.429	66	1.048	48	1.189
48	53.180	50	0.430	68	1.048	50	1.154
50	53.110	52	0.431	70	1.048	52	1.121
52	53.040	54	0.432	72	1.048	54	1.090
54	52.970	56	0.433	74	1.048	56	1.059
56	52.900	58	0.434	76	1.048	58	1.029
58	52.830	60	0.436	78	1.048	60	1.001
60	52.770	62	0.437	80	1.048	62	0.973
62	52.700	64	0.438	82	1.048	64	0.947
64	52.630	66	0.439	84	1.048	66	0.921
66	52.560	68	0.440	86	1.048	68	0.896
68	52.490	70	0.441			70	0.872
70	52.420	72	0.442			72	0.849
72	52.350	74	0.443			74	0.827
74	52.280	76	0.444			76	0.805
76	52.210	78	0.446			78	0.784
78	52.140	80	0.447			80	0.764
80	52.070	82	0.448			82	0.745
82	52.000	84	0.449			84	0.726

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	34	0.011	34	0.00029		N
	N	36	0.012	36	0.00031		O
	S	38	0.013	38	0.00033		T
	O	40	0.014	40	0.00036		
	L	42	0.015	42	0.00038		P
	U	44	0.016	44	0.00041		E
	B	46	0.018	46	0.00044		R
	I	48	0.019	48	0.00047		T
	E	50	0.020	50	0.00051		I
		52	0.022	52	0.00054		N
		54	0.024	54	0.00058		E
		56	0.025	56	0.00062		N
		58	0.027	58	0.00067		T
		60	0.029	60	0.00071		
		62	0.031	62	0.00076		
		64	0.034	64	0.00082		
		66	0.036	66	0.00087		
		68	0.039	68	0.00093		
		70	0.041	70	0.00099		
		72	0.044	72	0.00106		
		74	0.047	74	0.00113		
		76	0.051	76	0.00120		
		78	0.054	78	0.00128		
		80	0.058	80	0.00136		
		82	0.062	82	0.00145		
		84	0.066	84	0.00154		

# DIBENZOYL PEROXIDE

DPO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzoyl peroxide Benzoyl superoxide BP BPO Lucidol Oxylite	Solid powder or granules  White  Odorless   Sinks in water.
<b>Keep people away. Evacuate area in case of large discharge. Avoid inhalation. Wear goggles and self-contained breathing apparatus. Stay upwind and use water spray to "knock down" dust. Shut off ignition sources and call fire department. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE. MAY EXPLODE IF SUBJECTED TO HEAT, SHOCK OR FRICTION. May cause fire and explode on contact with combustibles. Evacuate surrounding area. Wear goggles and self-contained breathing apparatus. Combat fires from safe distance. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Keep organic materials away

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{14}H_{10}O_4$   
2.3 IMO/UN Designation: 5.2/1521  
2.4 DOT ID No.: 2085  
2.5 CAS Registry No.: 94-36-0  
2.6 NAERG Guide No.: 146  
2.7 Standard Industrial Trade Classification: 51629

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety goggles, face shield, rubber gloves.  
3.2 **Symptoms Following Exposure:** CONTACT WITH EYES OR SKIN: irritates eyes. Prolonged contact may irritate skin.  
3.3 **Treatment of Exposure:** INGESTION: administer an emetic to induce vomiting and call a physician.  
CONTACT WITH EYES OR SKIN: do not use oils or ointments; flush eyes with plenty of water and get medical attention; wash skin with plenty of soap and water.  
3.4 **TLV-TWA:** 5 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2: LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 1,500 mg/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 5 mg/m<sup>3</sup>  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Highly flammable solid; explosion-sensitive to shock, heat, and friction  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Difficult to extinguish once ignited. Use water spray to cool surrounding area.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use hand extinguishers  
4.5 **Special Hazards of Combustion Products:** Suffocating smoke evolved  
4.6 **Behavior in Fire:** May explode  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 69.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 19.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Special care must be taken to avoid contamination with combustible materials (wood, paper, etc.), various inorganic and organic acids, alkalies, alcohols, amines, easily oxidizable materials such as ethers, or materials used as accelerators in polymerization reactions.  
5.3 **Stability During Transport:** Extremely explosion-sensitive to shock (impact, blows), heat, and friction. Has been reported to explode for apparently no specific reason. Self-reactive.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98% (dry); 70-78% (wet); various pastes of dibenzoyl peroxide and liquid plasticizers such as tricresyl phosphate, silicone oil.  
7.2 **Storage Temperature:** 65-85°F  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Organic Peroxide  
8.2 **49 CFR Class:** 5  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	4

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 242.22  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** 217°F = 103°C = 376°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.334 at 15°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# DIBENZOYL PEROXIDE

DPO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	19.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 1,2-DICHLOROPROPANE

DPP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dichloropropane Propylene dichloride	Watery liquid Colorless Sweet odor
Sinks in water. Flammable, irritating vapor is produced.	
Keep people away. Avoid inhalation. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33; Halogenated hydrocarbon  
2.2 Formula:  $\text{CH}_2\text{CHClCH}_2\text{Cl}$   
2.3 IMO/UN Designation: 3.2/1279  
2.4 DOT ID No.: 1279  
2.5 CAS Registry No.: 78-87-5  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51138

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air supply in confined area, rubber gloves, chemical goggles, protective coveralls and rubber footwear.  
3.2 **Symptoms Following Exposure:** Contact with skin or eyes may cause irritation.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air. CONTACT WITH SKIN OR EYES: wash skin thoroughly with soap and water. Flush eyes with water for 15 min. Call a doctor.  
3.4 **TLV-TWA:** 75 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 110 ppm  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (guinea pig)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 400 ppm  
3.14 **OSHA PEL-TWA:** 75 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 70°F O.C. 60°F C.C.  
4.2 **Flammable Limits in Air:** 3.4%-14.5%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic and irritating gases may be generated.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 1035°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** (est.) 3.2 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 19.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** >100 ppm/crustacea/TL<sub>m</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Refined  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** U083  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 102.9  
9.3 **Boiling Point at 1 atm:** 206°F = 96.4°C = 369.6°K  
9.4 **Freezing Point:** -148°F = -100°C = 173°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.158 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 29 dynes/cm = 0.029 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 37.9 dynes/cm = 0.0379 N/m at 22.7°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.094  
9.12 **Latent Heat of Vaporization:** 122 Btu/lb = 67.7 cal/g =  $2.83 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** (est.) 7300 Btu/lb = 4100 cal/g =  $170 \times 10^3$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 13.53 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 1.9 psia

### NOTES

# 1,2-DICHLOROPROPANE

DPP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
70	71.809	0	0.338	65	0.874	55	0.959
75	71.570	10	0.339	70	0.873	60	0.923
80	71.330	20	0.341	75	0.872	65	0.888
85	71.089	30	0.343	80	0.871	70	0.856
90	70.839	40	0.344	85	0.870	75	0.825
95	70.599	50	0.346	90	0.869	80	0.796
100	70.360	60	0.348	95	0.867	85	0.769
105	70.110	70	0.349	100	0.866	90	0.743
110	69.870	80	0.351	105	0.865	95	0.718
115	69.629	90	0.353	110	0.864	100	0.695
120	69.389	100	0.354	115	0.863	105	0.672
125	69.139	110	0.356	120	0.862	110	0.651
130	68.900	120	0.358	125	0.861	115	0.631
135	68.660	130	0.359			120	0.612
140	68.419	140	0.361			125	0.593
145	68.169	150	0.363			130	0.576
150	67.931	160	0.364			135	0.559
155	67.690	170	0.366			140	0.543
160	67.440	180	0.368				
165	67.200	190	0.369				
170	66.959	200	0.371				
175	66.719						
180	66.469						
185	66.230						
190	65.990						
195	65.750						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.260	40	0.356	40	0.00682	0	0.205
		50	0.478	50	0.00899	25	0.213
		60	0.636	60	0.01172	50	0.220
		70	0.836	70	0.01513	75	0.227
		80	1.088	80	0.01933	100	0.235
		90	1.403	90	0.02447	125	0.242
		100	1.793	100	0.03071	150	0.248
		110	2.272	110	0.03823	175	0.255
		120	2.855	120	0.04721	200	0.262
		130	3.559	130	0.05786	225	0.268
		140	4.405	140	0.07042	250	0.275
		150	5.415	150	0.08513	275	0.281
		160	6.611	160	0.10230	300	0.287
		170	8.021	170	0.12210	325	0.293
		180	9.672	180	0.14490	350	0.299
		190	11.600	190	0.17110	375	0.305
		200	13.830	200	0.20090	400	0.310
		210	16.400	210	0.23480	425	0.316
						450	0.321
						475	0.327
						500	0.332
						525	0.337
						550	0.342
						575	0.346
						600	0.351

# DICYCLOPENTADIENE

DPT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arcosolv Dicy 3a,4,7,7a-Tetrahydro-4,7-Methanoindene	Liquid, or solid crystals  Colorless  Camphor odor  Floats on water. Freezing point is 41°F.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 30; Olefin  
2.2 **Formula:** C<sub>10</sub>H<sub>12</sub>  
2.3 **IMO/UN Designation:** 3.3/2048  
2.4 **DOT ID No.:** 2048  
2.5 **CAS Registry No.:** 77-73-6  
2.6 **NAERG Guide No.:** 129  
2.7 **Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Air-supplied mask in confined areas, rubber gloves, safety glasses.  
3.2 **Symptoms Following Exposure:** Vapor irritates mucous membranes and respiratory tract, causes nausea, vomiting, headache, and dizziness. Direct contact irritates skin.  
3.3 **Treatment of Exposure:** INHALATION: remove victim from contaminated area and call physician if unconscious; if breathing is irregular or stopped, give oxygen and start resuscitation. EYES OR SKIN: flush with plenty of water for 15 min.  
3.4 **TLV-TWA:** 5 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 0.82 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** <0.003 ppm.  
3.13 **IDLH Value:** Currently not available  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 90°F O.C.  
4.2 **Flammable Limits in Air:** 0.8%-6.3%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical, or water spray.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 941°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 61.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** May occur in presence of acids, but not hazardous.  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 97%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable Liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 132.31  
9.3 **Boiling Point at 1 atm:** 338°F = 170°C = 443°K  
9.4 **Freezing Point:** 41°F = 5°C = 278°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.978 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -18,800 Btu/lb = -10,400 cal/g = -437 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.16 psia

### NOTES

# DICYCLOPENTADIENE

DPT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	61.600	59	0.478	50	1.040	50	0.878
54	61.530	60	0.478	51	1.040	51	0.870
56	61.460	61	0.478	52	1.040	52	0.862
58	61.400	62	0.478	53	1.040	53	0.854
60	61.330	63	0.478	54	1.040	54	0.846
62	61.260	64	0.478	55	1.040	55	0.839
64	61.190	65	0.478	56	1.040	56	0.831
66	61.120	66	0.478	57	1.040	57	0.824
68	61.050	67	0.478	58	1.040	58	0.817
70	60.980	68	0.478	59	1.040	59	0.810
72	60.910	69	0.478	60	1.040	60	0.802
74	60.840	70	0.478	61	1.040	61	0.795
76	60.770	71	0.478	62	1.040	62	0.788
78	60.700	72	0.478	63	1.040	63	0.782
80	60.630	73	0.478	64	1.040	64	0.775
82	60.560	74	0.478	65	1.040	65	0.768
84	60.490	75	0.478	66	1.040	66	0.762
86	60.420	76	0.478	67	1.040	67	0.755
				68	1.040	68	0.749
				69	1.040	69	0.742
				70	1.040	70	0.736
				71	1.040	71	0.730
				72	1.040	72	0.724
				73	1.040	73	0.718
				74	1.040	74	0.712
				75	1.040	75	0.706

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.020	50	0.036	50	0.00088		N
		60	0.050	60	0.00119		O
		70	0.068	70	0.00159		T
		80	0.092	80	0.00210		
		90	0.122	90	0.00274		P
		100	0.161	100	0.00355		E
		110	0.210	110	0.00455		R
		120	0.272	120	0.00578		T
		130	0.348	130	0.00728		I
		140	0.443	140	0.00910		N
		150	0.558	150	0.01128		E
		160	0.698	160	0.01389		N
		170	0.868	170	0.01699		T
		180	1.071	180	0.02064		
		190	1.314	190	0.02492		
		200	1.601	200	0.02991		
		210	1.940	210	0.03570		
		220	2.337	220	0.04237		
		230	2.800	230	0.05003		
		240	3.337	240	0.05879		
		250	3.958	250	0.06875		
		260	4.673	260	0.08003		
		270	5.492	270	0.09276		
		280	6.425	280	0.10710		
		290	7.487	290	0.12310		
		300	8.688	300	0.14100		

# 1,3-DICHLOROPROPENE

DPU

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dichloropropene Telone	Liquid  Colorless  Sweet odor  Sinks in water. Flammable, irritating vapor is produced.
<b>Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Wear rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. WEAR GOGGLES AND SELF-CONTAINED BREATHING APPARATUS. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing, except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 15; Substituted allyl  
2.2 Formula:  $\text{ClCH}_2\text{CH}=\text{CHCl}$   
2.3 IMO/UN Designation: 3.3/2047  
2.4 DOT ID No.: 2047  
2.5 CAS Registry No.: 542-75-6  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51138

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** An approved full face mask equipped with a fresh black canister meeting specifications of the U.S. Bureau of Mines for organic vapors, a full face self-contained breathing apparatus, or full face air-supplied respirator.
- 3.2 **Symptoms Following Exposure:** Smarting of skin and eyes. Prolonged contact of liquid with skin may cause second-degree burns.
- 3.3 **Treatment of Exposure:** INHALATION: remove patient to fresh air, keep warm and quiet; call physician immediately; give artificial respiration if breathing has stopped. INGESTION: call physician immediately. Induce vomiting by giving an emetic, e.g., 2 tablespoons table salt in glass of warm water. CONTACT WITH SKIN OR EYES: immediately remove contaminated clothing and shoes. Wash skin with soap and plenty of water. For eyes, flush immediately with plenty of water for at least 15 min. Call physician.
- 3.4 TLV-TWA: 1 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3;  $\text{LD}_{50} = 50$  to 500 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 95°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Water, dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Toxic and irritating gases may be generated  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: (est.) 3.4 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 16.7 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 6.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 100 ppm\*/daphnia/toxic/fresh water  
\*Time period not specified.  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Telone soil fumigant: 100%; Telone C soil fungicide: 85%, chloropicrin 15%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Pressure-vacuum  
7.5 IMO Pollution Category: B  
7.6 Ship Type: 2  
7.7 Barge Hull Type: 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: U084  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 110.98  
9.3 Boiling Point at 1 atm: 170°F = 77°C = 350°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.2 at 20°C (liquid)  
9.8 Liquid Surface Tension: 31.2 dynes/cm = 0.0312 N/m at 24°C  
9.9 Liquid Water Interfacial Tension: 23.8 dynes/cm = 0.0238 N/m at 24°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.116  
9.12 Latent Heat of Vaporization: (est.) 113 Btu/lb = 62.8 cal/g =  $2.63 \times 10^5$  J/kg  
9.13 Heat of Combustion: (est.) 6900 Btu/lb = 3900 cal/g =  $160 \times 10^5$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 4.0 psia

### NOTES

# 1,3-DICHLOROPROPENE

DPU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	76.089	32	0.478		C	46	0.938
36	76.020	34	0.478		U	48	0.924
38	75.950	36	0.478		R	50	0.911
40	75.879	38	0.478		R	52	0.898
42	75.809	40	0.478		E	54	0.885
44	75.740	42	0.478		N	56	0.872
46	75.669	44	0.478		T	58	0.860
48	75.599	46	0.478		L	60	0.848
50	75.530	48	0.478		Y	62	0.836
52	75.459	50	0.478			64	0.824
54	75.389	52	0.478		N	66	0.813
56	75.320	54	0.478		O	68	0.802
58	75.250	56	0.478		T	70	0.791
60	75.179	58	0.478			72	0.780
62	75.120	60	0.478		A	74	0.770
64	75.049	62	0.478		V	76	0.760
66	74.980	64	0.478		A	78	0.750
68	74.910	66	0.478		I	80	0.740
70	74.839				L	82	0.730
72	74.770				A	84	0.721
74	74.700				B	86	0.712
76	74.629				L	88	0.703
78	74.559				E	90	0.694
80	74.490					92	0.685
82	74.419					94	0.677
84	74.349					96	0.668

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C	35	0.834	35	0.01743	30	0.163
	U	40	0.953	40	0.01972	40	0.165
	R	45	1.087	45	0.02226	50	0.167
	R	50	1.236	50	0.02507	60	0.170
	E	55	1.401	55	0.02815	70	0.172
	N	60	1.586	60	0.03155	80	0.174
	T	65	1.790	65	0.03527	90	0.176
	L	70	2.016	70	0.03935	100	0.178
	Y	75	2.265	75	0.04380	110	0.180
		80	2.540	80	0.04866	120	0.183
	N	85	2.842	85	0.05395	130	0.185
	O	90	3.174	90	0.05969	140	0.187
	T	95	3.537	95	0.06593	150	0.189
		100	3.934	100	0.07267	160	0.191
	A	105	4.368	105	0.07997	170	0.193
	V	110	4.840	110	0.08784	180	0.195
	A	115	5.354	115	0.09632	190	0.197
	I	120	5.912	120	0.10540	200	0.199
	L					210	0.201
	A					220	0.203
	B					230	0.205
	L					240	0.207
	E					250	0.208
						260	0.210

# DIPROPYLENE GLYCOL METHYL ETHER

DPY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dipropylene glycol monomethyl ether Dowanol-50B Dowanol DPM Ucar solvent 21M	Liquid  Colorless  Weak odor  Miscible with water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ethers  
2.2 Formula: CH<sub>3</sub>OC(CH<sub>2</sub>)<sub>2</sub>OC(CH<sub>2</sub>)<sub>2</sub>OH  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 34590-94-8  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.  
3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion, or skin absorption. May cause irritation.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Immediately flush with copious amounts of water for 15 minutes. SKIN: Flush with soap and copious amounts of water.  
3.4 **TLV-TWA:** 100 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 150 ppm  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5.135 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 600 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 166°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Emits toxic fumes under fire conditions.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 45.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 148.2  
9.3 **Boiling Point at 1 atm:** 363.2°F = 184°C = 457.2°K  
9.4 **Freezing Point:** -117°F = -82.78°C = 190.4°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.951  
9.8 **Liquid Surface Tension:** 28.8 dynes/cm = 0.029 N/m  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 5.11  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### NOTES



# DIPROPYLENE GLYCOL METHYL ETHER

DPY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	77	0.016		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.329 0.340 0.351 0.361 0.371 0.381 0.391 0.401 0.411 0.421 0.430 0.439 0.448 0.457 0.466 0.475 0.483 0.492 0.500 0.508 0.516 0.524 0.532 0.539 0.547

# DODECYLBENZENESULFONIC ACID

DSA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Conoco SA 597 Laurylbenzenesulfonic acid Nacconol 988 A	Liquid  Light yellow to brown  Possible odor of SO#M2  Mixes with water.
Keep people away. Avoid contact with liquid. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water (fog nozzle), carbon dioxide, or dry powder.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush exposed areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_{12}H_{25}SO_3$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2584
- 2.5 CAS Registry No.: 27176-87-0
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles, rubber gloves, air pack for contact with fumes in unventilated area.
- 3.2 **Symptoms Following Exposure:** EYES AND SKIN: A 0.5% to 1% concentration in water caused significant irritation. The technical grade is corrosive and may cause irreversible damage to eyes and skin. INGESTION: Irritation of the mouth, esophagus and stomach. Diarrhea, intestinal distention and occasional vomiting.
- 3.3 **Treatment of Exposure:** Call a physician. EYES AND SKIN: Flush eyes and skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. INGESTION: Give fluids and allow vomiting. See physician.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $LD_{50}$  = 50 to 500 mg/kg (mouse).
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Affected serum enzymes and electrolytes. Decrease in fetal body weight, length and construction. May facilitate penetration of carcinogens into gastric mucosa.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.
- 3.12 **Odor Threshold:** 200 mg/l affected odor of water.
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 300°F O.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water (Fog Nozzle),  $CO_2$ , dry powder
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** May give off  $SO_2$ ,  $SO_3$  and  $H_2S$
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 119.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 34.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Do not store in carbon steel or aluminum.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute sodium bicarbonate or soda ash solution
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**
  - 4.2 to 5.6 ppm/96-hour/Fathead minnows, Bluegills/TL-/soft water
  - 3.5 to 4.4 ppm/96-hour/Fathead minnows/TL-/hard water
  - 5 to 15 ppm/guppy/lethal concentration
  - 0.05 ppm reduced fertility rate of common mussel
  - 5 ppm reduced percentage of fertilized eggs of fish
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 3
  - Human Oral hazard: 1
  - Human Contact hazard: I
  - Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95% to 97.5%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 316 average
- 9.3 **Boiling Point at 1 atm:**  $>440^{\circ}F = >204.5^{\circ}C = >477.7^{\circ}K$
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1 at 25°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

NOTES

# DODECYLBENZENESULFONIC ACID

DSA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
75	67.238		C		C	70	1056.765
80	67.052		U		U	75	877.728
85	66.879		R		R	80	737.813
90	66.714		R		R	85	626.767
95	66.558		E		E	90	537.423
100	66.412		N		N	95	464.663
105	66.271		T		T	100	404.764
110	66.138		L		L	105	354.969
115	66.009		Y		Y	110	313.207
120	65.886					115	277.900
125	65.770		N		N	120	247.832
130	65.657		O		O	125	222.053
135	65.549		T		T	130	199.816
140	65.443					135	180.521
145	65.344		A		A	140	163.693
150	65.245		V		V		
155	65.151		A		A		
			I		I		
			L		L		
			A		A		
			B		B		
			L		L		
			E		E		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S		V		N		C
	O		E		O		U
	L		R		T		R
	U		Y		P		E
	B				E		N
	L		L		R		T
	E		O		T		L
			W				Y
							N
							O
							T
							A
							V
							A
							I
							L
							A
							B
							L
							E

# DODECYL SULFATE, DIETHANOLAMINE SALT

DSD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diethanolamine lauryl sulfate solution Lauryl sulfate, diethanolamine salt solution	Liquid  Clear to pale yellow  Mild odor  May float or sink and mix with water.
Keep people away. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:**  $C_{12}H_{25}OSO_3H(HOCH_2CH_2)_2NH\cdot H_2O$   
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical goggles or face shield; protective gloves  
3.2 **Symptoms Following Exposure:** Ingestion causes mild irritation of stomach. Liquid irritates eyes and causes some corneal damage after prolonged contact. Prolonged contact with skin causes mild irritation.  
3.3 **Treatment of Exposure:** INGESTION: consult a doctor if large amount was ingested. EYES: wash well with water, consult a doctor if irritation persists. SKIN: flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic vapors of diethanolamine and oxides nitrogen may form in fires.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 35-40% solution in water  
7.2 **Storage Temperature:** Below 38°C (100°F)  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** Not pertinent (solution)  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.01 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DODECYL SULFATE, DIETHANOLAMINE SALT

DSD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DIMETHYL SUCCINATE

DSE

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless
<b>Keep people away.</b> <b>Call fire department.</b> <b>Avoid contact with liquid.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>		
<b>Fire</b>	Combustible Water may be ineffective on fire. Wear self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> .	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be irritating. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID May be irritating. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 34; Esters  
2.2 **Formula:** CH<sub>3</sub>O<sub>2</sub>CCH<sub>2</sub>CH<sub>2</sub>CO<sub>2</sub>CH<sub>3</sub>  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 106-65-0  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.  
3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion or skin absorption. May cause irritation.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing give artificial respiration. If breathing is difficult give oxygen. SKIN: Wash with soap and copious amounts of water. EYES: Flush with copious amounts of water for at least 15 minutes.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 185°F C.C.  
4.2 **Flammable Limits in Air:** LEL 1%; UEL 8.5%  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 689°F (365°C)  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Will not occur  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 0  
Human Contact hazard: 1  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 146.14  
9.3 **Boiling Point at 1 atm:** 392°F = 200°C = 473.2°K  
9.4 **Freezing Point:** 64.4-66.2°F = 18-19°C = 291.2-292.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.117  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 5.04  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIMETHYL SUCCINATE

DSE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	68	0.006		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.225 0.233 0.242 0.250 0.258 0.267 0.275 0.283 0.291 0.298 0.306 0.314 0.321 0.328 0.336 0.343 0.350 0.357 0.364 0.370 0.377 0.383 0.389 0.396 0.402

# DIMETHYL SULFATE

DSF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methyl sulfate	Liquid  Colorless  Mild onion odor  Sinks and mixes slowly with water.
Evacuate. Keep people away. <b>AVOID CONTACT WITH LIQUID.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, foam, dry chemical, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump; Dredge  
Do not burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** (CH<sub>3</sub>)<sub>2</sub>SO<sub>4</sub>  
2.3 **IMO/UN Designation:** 6.1/1595  
2.4 **DOT ID No.:** 1595  
2.5 **CAS Registry No.:** 77-78-1  
2.6 **NAERG Guide No.:** 156  
2.7 **Standard Industrial Trade Classification:** 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical goggles; self-contained breathing apparatus; safety hat; rubber shoes; rubber suit; rubber gloves; safety shower and eye wash fountain.
- 3.2 **Symptoms Following Exposure:** Severe irritation to eyes, eyelids, respiratory tract and skin. Dry, painful cough; foamy, white sputum; difficulty in breathing; malaise and fever; inflammation and edema of lungs.
- 3.3 **Treatment of Exposure:** Contact with dimethyl sulfate liquid or vapor (> 1 ppm) requires immediate treatment. Call a physician, even if there is no evidence of injury, as symptoms may not appear for several hours. **INHALATION:** get victim to fresh air immediately; administer 100% oxygen, even if no injury is apparent, and continue for 30 min. each hour for 6 hours; give artificial respiration if breathing is weak or fails, but do not interrupt oxygen therapy; if victim's coughing prevents use of a mask, use oxygen tent under atmospheric pressure. **INGESTION:** do NOT induce vomiting. **SKIN:** wash thoroughly. **EYE:** flush with running water for at least 15 min.
- 3.4 **TLV-TWA:** 0.1 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Causes birth defects in rats (malignant tumors in nervous system).  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentration.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact; very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 7 ppm  
3.14 **OSHA PEL-TWA:** 1 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 240°F O.C. 182°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Flammable, toxic vapors generated  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 370°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 11.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Slow, non-hazardous reaction  
5.2 **Reactivity with Common Materials:** Corrodes metal when wet  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate or lime  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U013  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 126.13  
9.3 **Boiling Point at 1 atm:** 371.8°F = 188.8°C = 462.0°K  
9.4 **Freezing Point:** -25.2°F = -31.8°C = 241.4°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.33 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** 40.1 dynes/cm = 0.0401 N/m at 18°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 20 dynes/cm = 0.02 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# DIMETHYL SULFATE

DSF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	84.309	85	0.385		N	20	3.143
36	84.230	90	0.385		O	30	2.795
38	84.150	95	0.385		T	40	2.497
40	84.059	100	0.385			50	2.241
42	83.980	105	0.385		P	60	2.020
44	83.900	110	0.385		E	70	1.827
46	83.809	115	0.385		R	80	1.659
48	83.730	120	0.385		T	90	1.512
50	83.650	125	0.385		I	100	1.383
52	83.559	130	0.385		N	110	1.268
54	83.480	135	0.385		E	120	1.167
56	83.400	140	0.385		N	130	1.076
58	83.309	145	0.385		T	140	0.995
60	83.230	150	0.385			150	0.923
62	83.150					160	0.858
64	83.059					170	0.800
66	82.980					180	0.747
68	82.900					190	0.699
70	82.809					200	0.655
72	82.730					210	0.616
74	82.650						
76	82.559						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
64	2.800	20	0.002	20	0.00004		N
		30	0.002	30	0.00006		O
		40	0.004	40	0.00008		T
		50	0.005	50	0.00012		
		60	0.008	60	0.00018		P
		70	0.011	70	0.00025		E
		80	0.016	80	0.00035		R
		90	0.022	90	0.00048		T
		100	0.031	100	0.00065		I
		110	0.042	110	0.00088		N
		120	0.058	120	0.00117		E
		130	0.077	130	0.00154		N
		140	0.103	140	0.00201		T
		150	0.135	150	0.00260		
		160	0.176	160	0.00334		
		170	0.228	170	0.00425		
		180	0.293	180	0.00537		
		190	0.373	190	0.00674		
		200	0.471	200	0.00839		
		210	0.591	210	0.01038		
		220	0.737	220	0.01275		
		230	0.914	230	0.01557		
		240	1.125	240	0.01890		

# DIMETHYL SULFIDE

DSL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> DMS Methanethiomethane Methyl sulfide 2-Thiapropene	Liquid  Colorless to light yellow  Unpleasant odor  Floats and mixes slowly with water. Irritating vapor is produced. Boiling point is 99°F.
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Shut off ignition sources. Call fire department.</b> <b>Evacuate area in case of large discharge.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>S  
2.3 IMO/UN Designation: 3.1/1164  
2.4 DOT ID No.: 1164  
2.5 CAS Registry No.: 75-18-3  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respirator with organic vapor canister; rubber or plastic gloves; goggles or face shield.
- 3.2 **Symptoms Following Exposure:** Inhalation causes moderate irritation of upper respiratory system. Contact of liquid with eyes causes moderate irritation. Repeated contact with skin may extract oils and result in irritation. Ingestion causes nausea and irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air at once; enforce rest, and keep warm; get medical attention immediately. EYES: flush with water for at least 15 min.; if irritation persists, get medical attention. SKIN: flush with plenty of water and wash thoroughly; get treatment for any lasting irritation. INGESTION: if large amounts are swallowed, induce vomiting by tickling the back of the throat with the finger or by giving an emetic such as two tablespoons of common salt in a glass of warm water; get medical attention.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 535 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** 0.001 ppm
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
-36°F C.C.
- 4.2 **Flammable Limits in Air:** 2.2%-19.7%
- 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, alcohol foam, carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating sulfur dioxide is formed.
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 403°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 4.8 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Approximately 1 lb/lb
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: -  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.8%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 4              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 62.1
- 9.3 **Boiling Point at 1 atm:** 99°F = 37°C = 310°K
- 9.4 **Freezing Point:** -144°F = -98°C = 175°K
- 9.5 **Critical Temperature:** 444.2°F = 229°C = 502.2°K
- 9.6 **Critical Pressure:** 826 psia = 56.1 atm = 5.69 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.85 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 26.5 dynes/cm = 0.0265 N/m at 11°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** 2.14
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1277 at 16°C
- 9.12 **Latent Heat of Vaporization:** 194 Btu/lb = 108 cal/g = 4.52 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -13,200 Btu/lb = -7,340 cal/g = -307 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 30.73 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIMETHYL SULFIDE

DSL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	54.180	35	0.440	35	0.953	0	0.419
40	53.970	40	0.441	40	0.943	5	0.406
45	53.770	45	0.442	45	0.933	10	0.394
50	53.560	50	0.443	50	0.923	15	0.382
55	53.350	55	0.444	55	0.913	20	0.371
60	53.140	60	0.445	60	0.903	25	0.361
65	52.930	65	0.446	65	0.893	30	0.351
70	52.730	70	0.447	70	0.883	35	0.341
75	52.521	75	0.448	75	0.873	40	0.332
80	52.310	80	0.448	80	0.863	45	0.324
85	52.100	85	0.449	85	0.853	50	0.315
90	51.890	90	0.450	90	0.842	55	0.308
95	51.690	95	0.451	95	0.832	60	0.300
						65	0.293
						70	0.286
						75	0.279
						80	0.273
						85	0.267

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	2.000	-50	0.261	-50	0.00368	0	0.252
		-40	0.374	-40	0.00516	25	0.258
		-30	0.528	-30	0.00710	50	0.265
		-20	0.733	-20	0.00964	75	0.272
		-10	1.003	-10	0.01290	100	0.278
		0	1.354	0	0.01704	125	0.285
		10	1.805	10	0.02223	150	0.292
		20	2.377	20	0.02867	175	0.299
		30	3.095	30	0.03657	200	0.305
		40	3.988	40	0.04618	225	0.312
		50	5.088	50	0.05776	250	0.319
		60	6.431	60	0.07159	275	0.325
		70	8.057	70	0.08799	300	0.332
		80	10.010	80	0.10730	325	0.339
		90	12.340	90	0.12980	350	0.346
		100	15.090	100	0.15600	375	0.352
		110	18.330	110	0.18620	400	0.359
		120	22.120	120	0.22080	425	0.366
						450	0.372
						475	0.379
						500	0.386
						525	0.393
						550	0.399
						575	0.406
						600	0.413

# DODECYL SULFATE, MAGNESIUM SALT

DSM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lauryl magnesium sulfate Lauryl sulfate, magnesium salt Magnesium dodecyl sulfate Magnesium lauryl sulfate	Liquid  Light yellow  Mild odor  May float or sink and mix with water.
Keep people away. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $(C_{12}H_{25}OSO_2)_2Mg \cdot H_2O$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Ingestion causes mild irritation of stomach. Contact with liquid causes mild irritation of eyes. Skin is mildly irritated with prolonged contact.
- 3.3 Treatment of Exposure: INGESTION: consult a doctor if large amount was ingested. EYES: flush with water; consult a doctor if irritation persists. SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 27-30% solution in water
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 555 (solute)
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.04 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# DODECYL SULFATE, MAGNESIUM SALT

DSM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	64.919		N O T  P E R T I N E N T		N O T  P E R T I N E N T	77	50.000

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DISTILLATES: STRAIGHT RUN

DSR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Petroleum distillate Straight run gasoline	Watery liquid Colorless Gasoline-like odor  Floats on water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Avoid inhalation. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with foam or dry chemicals. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUIDS Irritating to eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not pertinent  
2.3 IMO/UN Designation: 3.1, 3.2, 3.3/1268  
2.4 DOT ID No.: 1268  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 33419

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Currently not available  
3.2 **Symptoms Following Exposure:** INHALATION: irritation of upper respiratory tract; dizziness, headache, coma, respiratory arrest; cardiac arrhythmias may occur. ASPIRATION: severe lung irritation, coughing, pulmonary edema, signs of bronchopneumonia; acute central nervous system excitation, followed by depression. INGESTION: irritation of mouth and stomach; other symptoms as above.  
3.3 **Treatment of Exposure:** Seek medical attention. INHALATION: maintain respiration and administer oxygen. ASPIRATION: enforce bed rest and administer oxygen. INGESTION: do NOT induce vomiting; lavage carefully if appreciable quantity was swallowed; guard against aspiration into lungs. EYES: wash with plenty of water. SKIN: remove by wiping and wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 5g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.25 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
(a) <0°F C.C. (b) 0°-73°F C.C. (c) 73°-141°F C.C.  
4.2 **Flammable Limits in Air:** 1.1-8.7%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Class I, group D  
4.9 **Burning Rate:** Approx. 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
90 ppm/24 hr/juvenile American shad/ TL<sub>50</sub>/fresh water  
91 ppm/24 hr/juvenile American shad/ TL<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 8%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Composition varies with range of distillation temperatures used.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 58-275°F = 14-135°C = 287-408°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.731 at 16°C (liquid)  
9.8 **Liquid Surface Tension:** 19-23 dynes/cm = 0.019-0.023 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 49-51 dynes/cm = 0.049-0.051 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.054  
9.12 **Latent Heat of Vaporization:** 130-150 Btu/lb = 71-81 cal/g = 3.0-3.4 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -18,720 Btu/lb = -10,400 cal/g = -435.4 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DISTILLATES: STRAIGHT RUN

DSR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	45.070	35	0.472	50	0.886	35	0.519
40	44.910	40	0.475	55	0.892	40	0.501
45	44.760	45	0.478	60	0.878	45	0.485
50	44.600	50	0.480	65	0.873	50	0.469
55	44.440	55	0.483	70	0.869	55	0.454
60	44.290	60	0.486	75	0.864	60	0.440
65	44.130	65	0.488	80	0.860	65	0.426
70	43.980	70	0.491	85	0.855	70	0.414
75	43.820	75	0.493	90	0.851	75	0.401
80	43.660	80	0.496	95	0.847	80	0.390
85	43.510	85	0.499	100	0.842	85	0.379
90	43.350	90	0.501	105	0.838	90	0.368
95	43.200	95	0.504	110	0.833	95	0.358
100	43.040	100	0.507	115	0.829	100	0.348
105	42.880	105	0.509	120	0.824	105	0.339
110	42.730			125	0.820	110	0.330
115	42.570			130	0.816	115	0.322
120	42.420			135	0.811	120	0.314
125	42.260					125	0.306
130	42.100					130	0.299
135	41.950					135	0.291
140	41.790					140	0.285
145	41.640					145	0.278
150	41.480					150	0.272
155	41.320					155	0.266
160	41.170					160	0.260

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	0	0.067		N		N
	N	10	0.100		O		O
	S	20	0.145		T		T
	O	30	0.207				
	L	40	0.291		P		P
	U	50	0.402		E		E
	B	60	0.546		R		R
	L	70	0.732		T		T
	E	80	0.968		I		I
		90	1.265		N		N
		100	1.633		E		E
		110	2.085		N		N
		120	2.635		T		T
		130	3.299				
		140	4.093				
		150	5.035				
		160	6.145				
		170	7.443				
		180	8.951				
		190	10.690				
		200	12.690				
		210	14.980				
		220	17.570				
		230	20.500				
		240	23.800				
		250	27.490				

# DIOCTYL SODIUM SULFOSUCCINATE

DSS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aerosol surfactant Aerowet D65 Di-(2-ethylhexyl) sulfosuccinate, sodium salt Bis-(2-Ethylhexyl) sodium sulfosuccinate	Waxy solid or watery solution  Colorless to white  Odorless  Sinks and mixes slowly with water.
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	Call for medical aid.  LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:**  
CaH17OOCCH2CH(SO3Na)COOCaH17  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 577-11-7  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:**  
51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical goggles; rubber gloves; dust respirator.  
3.2 **Symptoms Following Exposure:** Liquid is strong irritant to eye and may irritate skin by removing natural oils. Ingestion causes diarrhea and intestinal bloating.  
3.3 **Treatment of Exposure:** EYES: irrigate with copious volumes of water for at least 15 min.; call physician. SKIN: rinse off with water. INGESTION: drink large amounts of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 1,900 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Causes foaming and spreading of water. Assists in putting out fires by water.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Since many grades contain inert diluents, concentration of compound may be as low as 50% by weight. Many are water solutions.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** None  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid or liquid  
9.2 **Molecular Weight:** 444  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** (solid form) 311°F = 155°C = 428°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.1 at 20°C (solid or liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# DIOCTYL SODIUM SULFOSUCCINATE

DSS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
86	1.500		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DODECYL SULFATE, TRIETHANOLAMINE SALT

DST

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lauryl sulfate, triethanolamine salt Triethanolamine lauryl sulfate	Liquid	Colorless	Mild odor
Sinks and mixes with water.			
Keep people away. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_{12}H_{25}OSO_3H(HOCH_2CH_2)_3N \cdot H_2O$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Rubber gloves; goggles or face shield
- 3.2 Symptoms Following Exposure: Ingestion causes mild irritation of stomach. Contact with liquid irritates eyes and causes some corneal damage if prolonged. Skin is mildly irritated on prolonged contact.
- 3.3 Treatment of Exposure: INGESTION: consult a doctor if large amount was ingested. EYES: flush with water; consult a doctor if irritation persists. SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Toxic vapors of triethanolamine and oxides of nitrogen may form in fire.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 0
  - Human Oral hazard: 0
  - Human Contact hazard: 0
  - Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 40-45% solution in water
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 415 (solute)
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: (est.) >1.1 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# DODECYL SULFATE, TRIETHANOLAMINE SALT

DST

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	68.660		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DIETHYL SULFATE

DSU

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diethyl sulphate Ethyl sulfate Sulfuric acid, diethyl ester	Liquid  Colorless  Ethereal, peppermint odor  Sinks and very slowly dissolves in water. Gradually decomposes to produce sulfuric acid.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear positive pressure breathing apparatus and special protective clothing. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible POISONOUS GASES ARE PRODUCED IN FIRE OR WHEN HEATED. Vapor may explode if ignited in an enclosed area. May cause fire on contact with a combustible material. Wear positive pressure breathing apparatus and special protective clothing. Combat fire from safe distance or protected area. Extinguish small fire: dry chemicals, CO <sub>2</sub> , water spray or foam; large fire: water spray, fog or foam. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, skin and mucous membranes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush contaminated areas with plenty of running water. IF IN EYES: hold eyelids open and flush with running water for at least 15 minutes. IF ON SKIN: Wash with soap and plenty of running water; speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED: and victim is CONSCIOUS, give two glasses of water and induce vomiting. IF SWALLOWED: and victim is UNCONSCIOUS, do nothing but keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Collection Systems: Pump; Dredge  
Do not burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 34; Esters  
2.2 **Formula:** (C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>SO<sub>4</sub>  
2.3 **IMO/UN Designation:** 6.1/1594  
2.4 **DOT ID No.:** 1594  
2.5 **CAS Registry No.:** 64-67-5  
2.6 **NAERG Guide No.:** 152  
2.7 **Standard Industrial Trade Classification:** 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear positive pressure breathing apparatus and special protective clothing.
- 3.2 **Symptoms Following Exposure:** May be fatal if inhaled, swallowed or absorbed through skin. Inhalation causes nausea and vomiting. Causes burns to skin and eyes. Ingestion may cause nausea, vomiting abdominal pain and collapse.
- 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Irrigate with running water for at least 15 min.; hold eyelids open if necessary. Consult an ophthalmologist immediately. Wash skin with soap and water. Speed in removing material from skin is of extreme importance. Remove contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. INGESTION: If victim is conscious, give victim two glasses of water and have victim induce vomiting.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2: LD<sub>50</sub> = 647 mg/kg (mouse)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes mutagenic, tumorigenic and congenerenic effects.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor cause severe irritation of eyes and throat (mucous membranes) and can cause eye and lung injury.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 235°F O.C.  
220°F C.C
- 4.2 **Flammable Limits in Air:** 4.1% (LFL)
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam. Alcohol foam, unvirsal foam. Water or foam may cause frothing.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Highly toxic fumes containing sulfur oxides may be generated along with thermal decomposition products such as ethyl ether and ethylene. Sulfuric acid may be produced in the presence of moisture.
- 4.6 **Behavior in Fire:** It burns to yield highly, toxic sulfur oxides. Above 100°C, it undergoes thermal decomposition to yield ethyl ether, ethylene and sulfur oxides which may cause an explosion in closed containers or confined spaces.
- 4.7 **Auto Ignition Temperature:** 817°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly with cold water about 0.05 percent per hour at 25°C, to yield monoethyl sulfate and ethyl alcohol. Reacts vigorously with water at temperature above 50°C. Sulfuric acid may be produced along with ethyl alcohol and monoethyl sulfate.
- 5.2 **Reactivity with Common Materials:** Avoid contact with aqueous alkali, concentrated nitric acid and strong oxidizing agents such as peroxides and peracids. Violent reaction occurs with potassium and tert-butoxide. It may react with moisture to yield sulfuric acid which subsequently may react with a metal container to liberate hydrogen gas resulting in an explosion.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Dilute aqueous sodium hydroxide.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
TLm 96: 100-10 ppm
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 100%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Not listed
- 7.4 **Venting:** Not pertinent
- 7.5 **IMO Pollution Category:** (B)
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 154.18
- 9.3 **Boiling Point at 1 atm:** 409°F = 209.5°C = 483°K
- 9.4 **Freezing Point:** -12°F = -24.4°C = 249°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.1803 at 20°C
- 9.8 **Liquid Surface Tension:** 33.5 dynes/cm = .034 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 5.3
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIETHYL SULFATE

DSU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	73.810		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	68	1.790

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.700	175 200 225 250 275 300 325 350	0.138 0.282 0.531 0.935 1.560 2.490 3.827 5.700	125 150 175 200 225 250 275 300 325 350	0.00057 0.00143 0.00310 0.00608 0.01099 0.01868 0.03017 0.04674 0.06993 0.10153		C U R R E N T L Y  N O T  A V A I L A B L E

# DIAMMONIUM SALT OF ZINC EDTA

DSZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> EDTA-zinc EDTA-zinc complex EDTA zinc salt Zinc ethylenediaminetetraacetate		No reaction with water. May float or sink in water.
Notify local health and pollution control agencies. Keep people away. Protect water intakes.		
<b>Fire</b>	Not flammable. Fire may produce irritating or poisonous gases. Wear goggles, self contained breathing apparatus and rubber over clothing. Extinguish small fires with dry chemicals. CO <sub>2</sub> , water spray or foam. Extinguish large fires with water spray, fog or foam.	
<b>Exposure</b>	Call for medical aid. Irritating to skin and eyes. IF IN EYES, hold eyes open and flush with running water for at least 15 minutes. IF ON SKIN, wash with soap and water. Remove contaminated clothing and shoes.	
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify operators of nearby water intakes. Notify local health and wild life officials.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 43;  
Miscellaneous Water Solutions  
2.2 **Formula:** C<sub>10</sub>H<sub>12</sub>N<sub>2</sub>O<sub>8</sub>Zn  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 12519-36-7  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:**  
51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses with shields, rubber gloves, and dust mask.  
3.2 **Symptoms Following Exposure:** EYES: May cause eye irritation. SKIN: May cause skin irritation.  
3.3 **Treatment of Exposure:** EYES: Flush eyes with running water for at least 15 minutes. SKIN: Wash skin with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 85 mg/Kg (Zn)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Small fires:  
Dry chemicals, CO<sub>2</sub>, water spray or foam.  
Large fires: Water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Fire may produce irritating or poisonous gases  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Currently not available  
9.2 **Molecular Weight:** 302.811  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIAMMONIUM SALT OF ZINC EDTA

DSZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

# DODECYLTRICHLOROSILANE

DTC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Liquid	Colorless	Sharp, irritating odor
Reacts with water. Irritating gas is produced on contact with water.			
<p>Keep people away. Avoid contact with liquid and vapor. Wear goggles and self-contained breathing apparatus. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</p>			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE.		
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_{11}\text{SiCl}_3$   
2.3 IMO/UN Designation: 8/1771  
2.4 DOT ID No.: 1771  
2.5 CAS Registry No.: 4484-72-4  
2.6 NAERG Guide No.: 156  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Acid-vapor type respiratory protection; rubber gloves; chemical worker's goggles; other protective equipment as necessary to protect eyes and skin.
- 3.2 **Symptoms Following Exposure:** Inhalation irritates mucous membrane. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; support respiration; call physician if needed. EYES: flush with water for 15 min.; obtain medical attention immediately. SKIN: flush with water; obtain medical attention if skin is burned. INGESTION: if victim is conscious, give large amounts of water, then milk or milk of magnesia.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
> 150°F O.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam
- 4.5 **Special Hazards of Combustion Products:** Hydrochloric acid and phosgene fumes may form in fires.
- 4.6 **Behavior in Fire:** Difficult to extinguish; re-ignition may occur. Contact with water applied to adjacent fires produces irritating hydrogen chloride fumes.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 88.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 27.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Generates hydrogen chloride (hydrochloric acid).
- 5.2 **Reactivity with Common Materials:** Reacts with surface moisture to generate hydrogen chloride, which is corrosive to common metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 303.7
- 9.3 **Boiling Point at 1 atm:** >300°F = >149°C = >422°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.03 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -11,000 Btu/lb = -6,200 cal/g = -260 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# DODECYLTRICHLOROSILANE

DTC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	64.849	52	0.441	52	1.048	N O T  P E R T I N E N T	
54	64.780	54	0.442	54	1.048		
56	64.709	56	0.443	56	1.048		
58	64.639	58	0.444	58	1.048		
60	64.570	60	0.446	60	1.048		
62	64.500	62	0.447	62	1.048		
64	64.429	64	0.448	64	1.048		
66	64.360	66	0.449	66	1.048		
68	64.290	68	0.450	68	1.048		
70	64.230	70	0.451	70	1.048		
72	64.160	72	0.452	72	1.048		
74	64.089	74	0.453	74	1.048		
76	64.020	76	0.454	76	1.048		
78	63.950	78	0.456	78	1.048		
80	63.880	80	0.457	80	1.048		
82	63.810	82	0.458	82	1.048		
84	63.740	84	0.459	84	1.048		
86	63.670	86	0.460	86	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DICHLOROTETRAFLUOROETHANE

DTE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Dichlorotetrafluoroethane F-114 Fluorane 114 Freon 114 Halon 242 Refrigerant 114	Gas  Colorless  Slight, ethereal odor
<b>Keep people away. Avoid contact with vapor or liquid. Stay upwind; keep out of low areas. Wear self-contained positive pressure breathing apparatus and full protective clothing.</b>	
<b>Fire</b>	Not flammable. Container may explode in heat of fire. Move container from fire area if you can do it without risk. Stay away from ends of tanks. Cool containers that are exposed to flames with water from the side until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Vapors may cause dizziness or suffocation. Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Contact with liquid may cause frostbite. Remove contaminated clothing and shoes. Flush affected areas with lukewarm water. DO NOT USE HOT WATER.
<b>Water Pollution</b>	Not pertinent

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: C<sub>2</sub>Cl<sub>2</sub>F<sub>4</sub>
- 2.3 IMO/UN Designation: 2.2/1958
- 2.4 DOT ID No.: 1958
- 2.5 CAS Registry No.: 76-14-2
- 2.6 NAERG Guide No.: 126
- 2.7 Standard Industrial Trade Classification: 51137

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, rubber gloves, safety goggles, and safety shoes.
- 3.2 **Symptoms Following Exposure:** Prolonged exposure can cause narcotic effect or rapid suffocation.
- 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes. Wash affected areas with soap and water.
- 3.4 **TLV-TWA:** 1,000 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. Contact may cause frostbite.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 15,000 ppm
- 3.14 **OSHA PEL-TWA:** 1,000 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99 + %
- 7.2 **Storage Temperature:** Below 125 °F
- 7.3 **Inert Atmosphere:** Not pertinent
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Non-flammable gas
- 8.2 **49 CFR Class:** 2.2
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 170.93
- 9.3 **Boiling Point at 1 atm:** 38.8°F = 3.8°C = 277°K
- 9.4 **Freezing Point:** -137°F = -94°C = 179°K
- 9.5 **Critical Temperature:** 294.3°F = 145.7°C = 418.9°K
- 9.6 **Critical Pressure:** 473.2 psia = 32.2 atm = 3.3 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.455 at 25°C
- 9.8 **Liquid Surface Tension:** 12 dyne/cm = .012 N/m at 25°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 5.89
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** 58.5 Btu/lb = 32.5 cal/g = 1.36 x 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 50.6 psia

### NOTES

# DICHLOROTETRAFLUOROETHANE

DTE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	90.830		C U R R E N T L Y  N O T  A V A I L A B L E	80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155	0.464 0.491 0.514 0.535 0.553 0.570 0.586 0.600 0.613 0.625 0.635 0.646 0.655 0.664 0.672 0.680	77	0.380

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.013	-130 -120 -110 -100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0 10	0.049 0.070 0.100 0.144 0.207 0.298 0.428 0.616 1.273 1.830 2.630 3.782 5.436 7.815 11.235	38	0.49000	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.139 0.141 0.144 0.146 0.149 0.152 0.155 0.158 0.161 0.165 0.168 0.172 0.176 0.180 0.184 0.188 0.193 0.198 0.203 0.208 0.214 0.220 0.226 0.232 0.239

# DOWTHERM

DTH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diphenyl-diphenyl ether mixture Dowtherm A		Liquid	Light to dark brown	Fragrant odor
		May float or sink in water. Freezing point is 54°F.		
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Combustible. Wear self-contained breathing apparatus. Extinguish with water, dry chemical, foam or carbon dioxide.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (C<sub>6</sub>H<sub>5</sub>-O-C<sub>6</sub>H<sub>5</sub>)(C<sub>6</sub>H<sub>5</sub>-C<sub>6</sub>H<sub>5</sub>)  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses  
3.2 **Symptoms Following Exposure:** Odor of hot material may cause discomfort. Mildly irritating to eyes and skin.  
3.3 **Treatment of Exposure:** INHALATION: if ill effects are experienced, remove to fresh air and get medical attention. INGESTION: no known antidote; treat the symptoms; induce vomiting if large amounts are swallowed and get medical attention. EYES OR SKIN: flush with plenty of water; get medical attention if ill effects develop.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2: LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.1-1.0 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** 1 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 255°F O.C.  
4.2 **Flammable Limits in Air:** At 500°F: 0.5%-6.2% At 300°F: 0.8%-3.3%  
4.3 **Fire Extinguishing Agents:** Water fog, foam, carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Irritating gases generated when heated  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 1150°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 73.5% Diphenyl ether, 26.5% Diphenyl (eutectic)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** 1  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 166  
9.3 **Boiling Point at 1 atm:** 494°F = 257°C = 530°K  
9.4 **Freezing Point:** 54°F = 12°C = 285°K  
9.5 **Critical Temperature:** 932.0°F = 500°C = 773.2°K  
9.6 **Critical Pressure:** 456 psia = 31 atm = 3.1 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.06 at 21°C (liquid)  
9.8 **Liquid Surface Tension:** 40.1 dynes/cm = 0.0401 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.046  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -14,000 Btu/lb = -7778 cal/g = -325.6 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DOWTHERM

DTH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	66.389	60	0.373	60	0.979	70	3.504
70	66.110	70	0.377	80	0.970	75	3.314
80	65.839	80	0.381	100	0.961	80	3.138
90	65.559	90	0.385	120	0.952	85	2.975
100	65.280	100	0.388	140	0.943	90	2.822
110	65.000	110	0.392	160	0.934	95	2.680
120	64.730	120	0.396	180	0.925	100	2.548
130	64.450	130	0.399	200	0.916	105	2.424
140	64.169	140	0.403	220	0.907	110	2.308
150	63.890	150	0.407	240	0.898	115	2.200
160	63.620	160	0.411	260	0.890	120	2.098
170	63.340	170	0.414	280	0.881	125	2.003
180	63.060	180	0.418	300	0.872	130	1.914
190	62.780	190	0.422	320	0.863	135	1.830
200	62.510	200	0.425	340	0.854	140	1.751
210	62.230	210	0.429	360	0.845	145	1.676
		220	0.433	380	0.836	150	1.606
		230	0.437			155	1.540
		240	0.440			160	1.478
		250	0.444			165	1.419
		260	0.448			170	1.363
						175	1.311
						180	1.261
						185	1.214
						190	1.169
						195	1.126

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
60	0.001	130	0.005	130	0.00013	100	0.285
		140	0.007	140	0.00018	120	0.293
		150	0.010	150	0.00025	140	0.300
		160	0.014	160	0.00034	160	0.307
		170	0.019	170	0.00047	180	0.314
		180	0.026	180	0.00063	200	0.322
		190	0.036	190	0.00085	220	0.329
		200	0.048	200	0.00112	240	0.336
		210	0.064	210	0.00148	260	0.343
		220	0.085	220	0.00193	280	0.350
		230	0.111	230	0.00249	300	0.358
		240	0.145	240	0.00320	320	0.365
		250	0.187	250	0.00407	340	0.372
		260	0.240	260	0.00515	360	0.379
		270	0.306	270	0.00648	380	0.387
		280	0.387	280	0.00809	400	0.394
		290	0.487	290	0.01005	420	0.401
		300	0.609	300	0.01240	440	0.408
		310	0.757	310	0.01522	460	0.415
		320	0.936	320	0.01857	480	0.423
		330	1.152	330	0.02255	500	0.430
		340	1.409	340	0.02724	520	0.437
		350	1.715	350	0.03276	540	0.444
		360	2.078	360	0.03920	560	0.452
		370	2.506	370	0.04670	580	0.459
		380	3.008	380	0.05540	600	0.466

# DIMETHYL PHTHALATE

DTL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Avolin DMP ENT 262 Fermine Methyl phthalate Mipax NTM Solvarone	Liquid  Colorless to pale yellow  Odorless   Sinks in water.
Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible Irritating gases may be produced when heated. Water may be ineffective on fire. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	LIQUID Not harmful
<b>Water Pollution</b>	Effect of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters
- 2.2 Formula: (C<sub>6</sub>H<sub>4</sub>)(COOCH<sub>3</sub>)<sub>2</sub>
- 2.3 IMO/UN Designation: Not Listed
- 2.4 DOT ID No.: Not Listed
- 2.5 CAS Registry No.: 131-11-3
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; goggles or face shield.
- 3.2 **Symptoms Following Exposure:** Symptoms unlikely from any exposure.
- 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air. EYES: Flush with water. SKIN: Flush with water, wash well with soap and water.
- 3.4 **TLV-TWA:** 5 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 6.8 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 2,000 mg/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 5 mg/m<sup>3</sup>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 295°F C.C.
- 4.2 **Flammable Limits in Air:** 0.9-8.0%
- 4.3 **Fire Extinguishing Agents:** CO<sub>2</sub>, dry chemicals, foam
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** 915°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No Reaction
- 5.2 **Reactivity with Common Materials:** No Reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not Pertinent
- 5.5 **Polymerization:** None
- 5.6 **Inhibitor of Polymerization:** Not Pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 2
  - Human Oral hazard: 1
  - Human Contact hazard: 0
  - Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not Listed
- 8.2 **49 CFR Class:** Not Pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** U102
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 194.20
- 9.3 **Boiling Point at 1 atm:** 543°F = 284°C = 557°K
- 9.4 **Freezing Point:** 34°F = 1°C = 274°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.1905 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 6.69
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** 284 Btu/lb = 158 cal/g = 6.6 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -10379 Btu/lb = -5766 cal/g = -241 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Very Low

### NOTES

# DIMETHYL PHTHALATE

DTL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	74.320		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.430	220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520 540	0.024 0.044 0.078 0.132 0.215 0.340 0.522 0.781 1.145 1.646 2.324 3.229 4.422 5.975 7.974 10.522 13.740		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.199 0.207 0.216 0.224 0.232 0.240 0.249 0.257 0.265 0.273 0.282 0.290 0.298 0.306 0.315 0.323 0.331 0.339 0.348 0.356 0.364 0.372 0.381 0.389 0.397

# 4,4'-DICHLORO-ALPHA-TRICHLOROMETHYL BENZHYDROL

DTM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,1-Bis(p-Chlorophenyl)-2,2,2-trichloroethanol Di-(p-chlorophenyl) trichloromethylcarbinol Dicofol Kelthane Kelthanethanol	Solid powder or liquid (solution)  Solid is white to grey  Solid is odorless; liquid has odor of solvent  May float or sink in water.
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Shut off ignition sources. Call fire department.</b> <b>Avoid contact with liquid and solid.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	LIQUID SOLVENT MAY BE FLAMMABLE. SOLID IS COMBUSTIBLE. Irritating gases may be produced when heated. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause headache or dizziness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID Irritating to skin and eyes. If swallowed will cause headache, nausea or dizziness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge  
Do not burn  
Clean shore line

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $(\text{ClC}_6\text{H}_4)_2\text{C}(\text{OH})\text{CCl}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51219

## 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Self-contained breathing apparatus if exposed to vapors; rubber gloves; splash goggles  
3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes nausea, headache, weight loss, convulsions, possible kidney and liver damage. Contact with eyes causes irritation.  
3.3 **Treatment of Exposure:** INHALATION: Move to fresh air; apply artificial respiration and oxygen if indicated. EYES: Wash for 15 min. with water; call a physician. SKIN: Wash well with soap and water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 575 \text{ mg/kg (rat)}$ ,  $1,810 \text{ mg/kg (rabbit)}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Suppresses immune reactions in rats  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

4.1 **Flash Point:** 75°F O.C. (xylene)  
4.2 **Flammable Limits in Air:** 1.1%-7.0% (for xylene solution)  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may form in fire.  
4.6 **Behavior in Fire:** Xylene solvent vapors may travel to source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 986°F (for xylene solution)  
4.8 **Electrical Hazards:** (xylene) Class 1, Group D  
4.9 **Burning Rate:** (xylene) 5.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 69.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 21.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Contact with steel at elevated temperature causes formation of toxic chlorine and hydrogen chloride gases. Liquid may attack some forms of plastics.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** 110 ppm/24 hr/rainbow trout/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** 1,700-1,900 ppm  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical; 82-88%; 35% plus 65% inert solids; 75% solution in xylene, a combustible solvent.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid or liquid  
9.2 **Molecular Weight:** 470.5  
9.3 **Boiling Point at 1 atm:** (Data apply to xylene solution; solid decomposes) 282°F = 139°C = 412°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** >1.1 at 20°C (solid) <0.9 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# 4,4'-DICHLORO-ALPHA-TRICHLOROMETHYL BENZHYDROL

DTM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

# DEMETON

DTN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> O,O[diethyl-o( and 5)-]2-(ethylthio)ethyl[phosphorothioates Systox and isosystox mixture	Liquid                      Yellowish-brown                      Unpleasant odor  Sinks in water.
<p><b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b>  Avoid inhalation.  Wear goggles and self-contained breathing apparatus.  Shut off ignition sources. Call fire department.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	Solution in a combustible solvent. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam or carbon dioxide.
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR  POISONOUS IF INHALED.  If inhaled will cause headache or difficult breathing.  If in eyes, hold eyelids open and flush with plenty of water.  If breathing has stopped, give artificial respiration.  If breathing is difficult, give oxygen.</p> <p>LIQUID  POISONOUS IF SWALLOWED.  Irritating to skin and eyes.  If swallowed will cause nausea, vomiting or loss of consciousness.  Remove contaminated clothing and shoes.  Flush affected areas with plenty of water.  IF IN EYES, hold eyelids open and flush with plenty of water.  IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump  
Chemical and Physical Treatment:  
Absorb  
Do not burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** C<sub>8</sub>H<sub>18</sub>O<sub>2</sub>PS<sub>2</sub>-CaH<sub>10</sub> mixture  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 8065-48-3  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor respirator in confined areas; rubber or latex gloves; splash goggles; rubber boots
- 3.2 **Symptoms Following Exposure:** Inhalation causes headache, vertigo, blurred vision, lachrymation, salivation, sweating, muscular weakness and ataxia, dyspnea, diarrhea, abdominal cramps, vomiting, coma, pulmonary edema, and death. Ingestion causes nausea, vomiting, muscle twitching, coma. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** Speed is essential. Call a physician after all overexposure to demeton. INHALATION: move to fresh air; if needed, begin artificial respiration. INGESTION: administer milk, water, or salt-water and induce vomiting repeatedly. EYES: flush with water for at least 15 min. SKIN: flood and wash exposed skin areas thoroughly with water; remove contaminated clothing under a shower; wash with soap and water.
- 3.4 **TLV-TWA:** 0.01 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; oral LD<sub>50</sub> = 1.7 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 10 mg/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup>  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 113°F C.C.  
4.2 **Flammable Limits in Air:** 1.0%-5.3%  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective on fire.  
4.5 **Special Hazards of Combustion Products:** Irritating fumes of sulfur dioxide and phosphoric acid may form in fire.  
4.6 **Behavior in Fire:** Compound may volatilize and form toxic fumes. Vapor of solvent is heavier than air and may travel considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 867°F (xylene solvent)  
4.8 **Electrical Hazards:** (xylene) Class I, Group D  
4.9 **Burning Rate:** 5.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May attack some forms of plastics.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.1 ppm/2-8 hr/bluegill/reduction of enzyme in brain/fresh water  
6.2 **Waterfowl Toxicity:** 7-15 mg/kg  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 25%-66% solution in xylenes, which are combustible solvents  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 258  
9.3 **Boiling Point at 1 atm:** > 284°F = > 140°C = > 413°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.1 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DEMETON

DTN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	69.290		N		N		N
51	69.259		O		O		O
52	69.219		T		T		T
53	69.190						
54	69.150		P		P		P
55	69.120		E		E		E
56	69.080		R		R		R
57	69.049		T		T		T
58	69.009		I		I		I
59	68.980		N		N		N
60	68.940		E		E		E
61	68.910		N		N		N
62	68.879		T		T		T
63	68.839						
64	68.809						
65	68.770						
66	68.740						
67	68.700						
68	68.669						
69	68.629						
70	68.599						
71	68.559						
72	68.530						
73	68.490						
74	68.459						
75	68.419						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DITRIDECYL PHTHALATE

DTP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> DTDP Jayflex DTDP Nuoplaz Phthalic acid, ditridecyl ester Polycizer 962-BPA Staiflex DTDP 1-Tridecanol, phthalate	Oily liquid  Colorless  Nearly odorless  Floats on water.
Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam or CO <sub>2</sub> . Cool hot container with water sprays.
<b>Exposure</b>	CALL FOR MEDICAL AID If ingested, induce vomiting. Remove contaminated clothes and shoes. Wash skin with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentration of aquatic life unknown. Fouling to shore line. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula: C<sub>44</sub>H<sub>90</sub>(COOC<sub>13</sub>H<sub>27</sub>)<sub>2</sub>  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 119-06-2  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus and full turn out gear (Fire resistant helmet with full neck and face covers, self-contained breathing apparatus, flame resistant coat and pants, pair of boots).
- 3.2 **Symptoms Following Exposure:** Mist or fumes from hot processing may cause irritation, nausea and vomiting.
- 3.3 **Treatment of Exposure:** INGESTION: Induce vomiting if person is conscious. Call physician, administer artificial respiration or oxygen if needed. SKIN: Wash with soap and water. EYES: Flush with water for 15 minutes.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are not irritating to eyes and throat.  
3.11 Liquid or Solid Characteristics: Minimum hazard. Practically harmless to skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 490°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Water spray, alcohol foam, carbon dioxide or dry chemical.  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Irritating vapor when heated.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 221.3 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 63.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.  
5.5 Polymerization: Not pertinent.  
5.6 Inhibitor of Polymerization: Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent.  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 530.8  
9.3 Boiling Point at 1 atm: >600°F = >315.6°C = >588.8°K  
9.4 Freezing Point: <-34.6°F = <-37°C = <236.2°K (pour point)  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 0.951  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 18.3  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

NOTES

# DITRIDECYL PHTHALATE

DTP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	25	190.000

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	N E G L I G I B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.300 0.314 0.327 0.340 0.352 0.365 0.377 0.389 0.401 0.413 0.424 0.435 0.446 0.457 0.467 0.478 0.488 0.498 0.508 0.517 0.526 0.536 0.545 0.554 0.562

# DEXTROSE SOLUTION

DTS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Corn sugar solution Glucose solution Grape sugar solution	Watery liquid	Colorless	Odorless
	Sinks and mixes with water.		
Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable.		
<b>Exposure</b>	Not harmful.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 43;  
Miscellaneous Water Solutions  
2.2 **Formula:** C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>·H<sub>2</sub>O  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:**  
51692

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** None needed  
3.2 **Symptoms Following Exposure:** No toxicity  
3.3 **Treatment of Exposure:** None needed  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** None  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** None  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 53%, 5 days; 99% (theor), 5 days  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 65-69% solids  
7.2 **Storage Temperature:** 130° to 145°F  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** >212°F = >100°C = >373°K  
9.4 **Freezing Point:** <32°F = <0°C = <273°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) 1.20 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 60 dynes/cm = 0.06 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DEXTROSE SOLUTION

DTS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
32	74.910	32	0.836	46	2.288	32	2.604
34	74.910	34	0.836	48	2.288	34	2.554
36	74.910	36	0.836	50	2.288	36	2.506
38	74.910	38	0.836	52	2.288	38	2.459
40	74.910	40	0.836	54	2.288	40	2.413
42	74.910	42	0.836	56	2.288	42	2.368
44	74.910	44	0.836	58	2.288	44	2.325
46	74.910	46	0.836	60	2.288	46	2.283
48	74.910	48	0.836	62	2.288	48	2.241
50	74.910	50	0.836	64	2.288	50	2.201
52	74.910	52	0.836	66	2.288	52	2.162
54	74.910	54	0.836	68	2.288	54	2.124
56	74.910	56	0.836	70	2.288	56	2.087
58	74.910	58	0.836	72	2.288	58	2.050
60	74.910	60	0.836	74	2.288	60	2.015
62	74.910	62	0.836	76	2.288	62	1.981
64	74.910	64	0.836	78	2.288	64	1.947
66	74.910	66	0.836	80	2.288	66	1.914
68	74.910	68	0.836			68	1.882
70	74.910	70	0.836			70	1.851
72	74.910	72	0.836			72	1.820
74	74.910	74	0.836			74	1.791
76	74.910	76	0.836			76	1.761
78	74.910	78	0.836			78	1.733
80	74.910	80	0.836			80	1.705

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 2,4-DINITROTOLUENE

DTT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,4-Dinitrotoluol DNT 1-Methyl-2, 4-dinitrobenzene	Solid or heated liquid      Yellow to red solid or yellow liquid      Slight odor  Liquid solidifies. Solid and liquid sink in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND SOLID.</b> Avoid inhalation. Wear rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CON- VULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 2, 4-(NO<sub>2</sub>)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CH<sub>3</sub>  
2.3 IMO/UN Designation: Solid: 6.1/2038;  
liquid: 6.1/1600  
2.4 DOT ID No.: 1600 (Liquid); 2038 (Solid)  
2.5 CAS Registry No.: 121-14-2  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification:  
51140

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-line mask or self-contained breathing apparatus; safety goggles  
and face shield; rubber gloves and boots; protective clothing.  
3.2 **Symptoms Following Exposure:** Ingestion or overexposure to vapors from hot liquid can cause loss  
of color, nausea, headache, dizziness, drowsiness, collapse. Hot liquid can burn eyes and skin.  
Prolonged skin contact with solid can give same symptoms as after inhalation or ingestion.  
3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; get medical attention for  
methemoglobinemia. EYES: flush with copious amounts of water and get medical attention. SKIN:  
wash well with soap and water. INGESTION: induce vomiting, if victim is conscious; give gastric  
lavage and saline cathartic; get medical attention.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; oral LD<sub>50</sub> = 30 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May cause liver damage, anemia, neuritis.  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 404°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, dry  
chemical, carbon dioxide from protected  
location  
4.4 **Fire Extinguishing Agents Not to Be  
Used:** Currently not available  
4.5 **Special Hazards of Combustion  
Products:** Nitrogen oxides and dense  
black smoke are produced in a fire.  
4.6 **Behavior in Fire:** Decomposition is self-  
sustaining at 280°C. Containers may  
explode in a fire.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently  
not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5  
(calc.)  
4.12 **Flame Temperature:** Currently not  
available  
4.13 **Combustion Molar Ratio (Reactant to  
Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for  
Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No  
reaction  
5.3 **Stability During Transport:** Stable below  
482°F (250°C)  
5.4 **Neutralizing Agents for Acids and  
Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not  
available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical. Mixtures such as  
an 80:20 mixture of 2, 4- and 2, 6-isomers are  
also available. The hazard properties are  
similar.  
7.2 **Storage Temperature:** Ambient (solid); >90°C  
(liquid)  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	3

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: U105/D030  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 182.1  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** 158°F = 70°C = 343°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.379 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not  
available  
9.9 **Liquid Water Interfacial Tension:** Currently  
not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** 170 Btu/lb =  
93 cal/g = 3.9 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -8,305 Btu/lb =  
-4,614 cal/g = -193.0 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 26.40 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not  
available

### NOTES



# 2,4-DINITROTOLUENE

DTT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T	211	0.349		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.021		N		N		N
36	0.022		O		O		O
38	0.022		T		T		T
40	0.022						
42	0.022		P		P		P
44	0.023		E		E		E
46	0.023		R		R		R
48	0.023		T		T		T
50	0.024		I		I		I
52	0.024		N		N		N
54	0.024		E		E		E
56	0.024		N		N		N
58	0.025		E		E		E
60	0.025		N		N		N
62	0.025		T		T		T
64	0.026						
66	0.026						
68	0.026						
70	0.026						
72	0.027						
74	0.027						
76	0.027						
78	0.028						
80	0.028						
82	0.028						
84	0.029						

# DIUNDECYL PHTHALATE

DUP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Benzenedicarboxylic acid, di-undecyl ester Phthalic acid, diundecyl ester Santizizer 711	Liquid  Colorless  Odorless  Floats on water.
Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide.
<b>Exposure</b>	Not harmful.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 34; Esters  
2.2 **Formula:** (C<sub>21</sub>H<sub>42</sub>)(COOC<sub>11</sub>H<sub>23</sub>)<sub>2</sub>  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 3648-20-2  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:**  
51385

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Not required  
3.2 **Symptoms Following Exposure:** Produces no ill effects at normal temperatures but may give off irritating vapor at high temperature.  
3.3 **Treatment of Exposure:** Leave contaminated area; wash skin with soap and water; flush eyes with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, CO<sub>2</sub>, or foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 192.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 55.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Cautics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 442.80  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 15.3  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DIUNDECYL PHTHALATE

DUP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.326 0.337 0.349 0.360 0.372 0.383 0.395 0.407 0.418 0.430 0.441 0.453 0.464 0.476 0.488 0.499 0.511 0.522 0.534 0.546 0.557 0.569 0.580 0.592 0.603

# DURSBAN

DUR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlorpyrifos Dowco 179 ENT 27,311 Killmaster Lorsban	Solid crystals or liquid solutions    White    Mild mercaptan  Sinks in water.
Evacuate. Keep people away. <b>AVOID CONTACT WITH LIQUID.</b> Avoid inhalation. Wear chemical protective suit with self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID POISONOUS IF SWALLOWED OR SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> Not listed. <b>2.2 Formula:</b> C <sub>8</sub> H <sub>11</sub> Cl <sub>3</sub> NO <sub>3</sub> PS <b>2.3 IMO/UN Designation:</b> 6.1/1615 (>2.5%); 9/1615 (<2.5%) <b>2.4 DOT ID No.:</b> 2783 <b>2.5 CAS Registry No.:</b> Currently not available <b>2.6 NAERG Guide No.:</b> 152 <b>2.7 Standard Industrial Trade Classification:</b> 51631
<b>3. HEALTH HAZARDS</b>  <b>3.1 Personal Protective Equipment:</b> Protective clothing, masks, suitable eye protection such as safety glasses. <b>3.2 Symptoms Following Exposure:</b> Symptoms of organophosphate insecticide poisoning: cholinesterase inhibition, headache, fatiguedizziness, blurred vision, weakness, nausea, cramps, diarrhea, chest discomfort, sweating, miosis, tearing, salivation, vomiting, cyanosis, papilledema, and muscle twitching. In advanced cases convulsions, coma, loss of reflexes, and loss of sphincter control may occur. EYES: Can produce mild to moderate eye irritation and transient corneal injury. SKIN: Undiluted liquid products can cause skin irritation. Prolonged or repeated exposure may cause superficial burns. <b>3.3 Treatment of Exposure:</b> Call physician immediately. INHALATION: Give first aid. Artificial respiration may be required. EYES: Irrigate with plenty of clear water. SKIN: Remove any contaminated clothing and wash patient thoroughly with copious quantities of water - use soap, if available. INGESTION: If conscious, give copious quantities of soapy or salty water and induce vomiting. Some formulations contain petroleum distillates but, because of the toxicity of Dursban, inducing vomiting is recommended unless a physician is present and can do gastric lavage. OTHER: Atropine (2 to 4 mg) every 5 to 10 minutes until signs of atropinization occur. <b>3.4 TLV-TWA:</b> Skin, 0.2 mg/m <sup>3</sup> <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 3; LD <sub>50</sub> = 50 to 500 mg/kg. <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Plasma, red cell, and brain cholinesterase activity was depressed. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Currently not available <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of skin. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** Currently not available  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Currently not available  
**4.4 Fire Extinguishing Agents Not to Be Used:** Currently not available  
**4.5 Special Hazards of Combustion Products:** Currently not available  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 59.5 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 18.5 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Currently not available  
**5.5 Polymerization:** Currently not available  
**5.6 Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
 48-hour LC<sub>50</sub> - Rainbow trout = 0.02 ppm  
 24-hour LC<sub>50</sub> - Rainbow trout = 0.110 ppm  
 36-hour TL<sub>m</sub> - Mosquito fish = 0.23 ppm - laboratory  
 36-hour TL<sub>m</sub> - Mosquito fish = 0.595 ppm - acclimated  
 36-hour TL<sub>m</sub> - Bluegill - 0.038 ppm - laboratory  
 36-hour TL<sub>m</sub> - Bluegill = 0.125 ppm - acclimated  
**6.2 Waterfowl Toxicity:** Mallard LD<sub>50</sub> = 70 to 80 mg/kg  
**6.3 Biological Oxygen Demand (BOD):** Degradable  
**6.4 Food Chain Concentration Potential:** 1/2 is lost from fish flesh in less than 1 week.  
**6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Technical grade - minimum 98% purity  
**7.2 Storage Temperature:** Currently not available  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Poison  
**8.2 49 CFR Class:** 6.1  
**8.3 49 CFR Package Group:** II  
**8.4 Marine Pollutant:** Yes  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Currently not available  
**9.2 Molecular Weight:** 350.59  
**9.3 Boiling Point at 1 atm:** Currently not available  
**9.4 Freezing Point:** 106.7° to 110.3°F = 41.5° to 43.5°C = 314.7° to 316.7°K  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** Currently not available  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** 12.09 (calculated)  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# DURSBAN

DUR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# N,N-DIMETHYLCYCLOHEXYLAMINE

DXN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cyclohexylamine, n,n-dimethyl n-Dimethylcyclohexanamine	Liquid	Colorless	Musky ammonia odor
Floats and mixes slowly with water.			
Keep people away. Avoid contact with vapor or liquid. Avoid inhalation. Wear self-contained breathing apparatus and full protective clothing. Restrict ignition sources. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	COMBUSTIBLE. Flashback along vapor trail may occur. Containers may explode in fire. Vapor may explode if ignited in enclosed area. Wear self-contained breathing apparatus and full protective clothing. Extinguish with CO <sub>2</sub> , dry chemicals, or foam.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Strong irritant to eyes, nose and throat. Harmful if inhaled; could be fatal. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. IF IN EYES, flush with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Flush affected areas with plenty of running water.		
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amines  
2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>NC<sub>6</sub>H<sub>11</sub>  
2.3 IMO/UN Designation: 8/2264  
2.4 DOT ID No.: 2264  
2.5 CAS Registry No.: 98-94-2  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51453

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained breathing apparatus, rubber boots, heavy rubber gloves. If entering spill area, wear self-contained breathing apparatus and full protective clothing, including boots.  
3.2 **Symptoms Following Exposure:** Inhalation of high concentration of vapor will produce irritation of the respiratory tract and lungs. Inhalation of large quantities of vapor may be fatal.  
3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove from exposure area. If the victim has trouble breathing, give oxygen. If breathing has stopped, give artificial respiration. EYES: Flush eyes with water for at least 15 minutes. SKIN: Remove contaminated clothing. Flush affected areas with plenty of running water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 348 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are irritating such that personnel will not tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third-degree burns on short contact and is very injurious to eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 108°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical powder, polymer or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Dangerous when exposed to heat or flame. Can react vigorously with oxidizing materials.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 63.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 17.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Not reactive  
5.2 **Reactivity with Common Materials:** Not reactive  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Will not occur  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%, 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Not listed  
7.4 **Venting:** Not listed  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 127.23  
9.3 **Boiling Point at 1 atm:** 323.6°F = 162°C = 435.2°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.849 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.4 (est)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N,N-DIMETHYLCYCLOHEXYLAMINE

DXN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.031 0.035 0.039 0.043 0.047 0.051 0.055 0.060 0.064 0.068 0.072 0.076 0.080 0.084 0.088 0.093 0.097 0.101 0.105 0.109 0.113 0.117 0.121 0.126 0.130

# DIAZINON

DZN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Alfa-tox O,O-Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl)phosphorothioate Saralex Spectracide		Liquid  Light to dark brown  Sinks in water.
Keep people away. Avoid inhalation. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>12</sub> H <sub>21</sub> N <sub>2</sub> O <sub>3</sub> PS 2.3 IMO/UN Designation: 6.1/1615 2.4 DOT ID No.: 3018 2.5 CAS Registry No.: 333-41-5 2.6 NAERG Guide No.: 152 2.7 Standard Industrial Trade Classification: 51631
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Goggles or face shield; rubber gloves; protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Ingestion or prolonged inhalation of mist causes headache, giddiness, blurred vision, nervousness, weakness, cramps, diarrhea, discomfort in the chest, sweating, miosis, tearing, salivation and other excessive respiratory tract secretion, vomiting, cyanosis, papilledema, uncontrollable muscle twitches, convulsions, coma, loss of reflexes, and loss of sphincter control. Liquid irritates eyes and skin. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove to fresh air; keep warm; get medical attention at once. EYES: flush with plenty of water for at least 15 min. and get medical attention. SKIN: wash contaminated area with soap and water. INGESTION: get medical attention at once; give water slurry of charcoal; do NOT give milk or alcohol. 3.4 TLV-TWA: 0.1 mg/m <sup>3</sup> 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 3; oral LD <sub>50</sub> = 76 mg/kg (rat) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: May be mutagenic 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 82-105°F C.C. (solutions only; pure liquid difficult to burn)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** (for solutions) Foam, dry chemical, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Oxides of sulfur and of phosphorus are generated in fires.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** (for solutions) 4 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 95.2 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 26.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 0.025 ppm/96 hr/stonefly nymph/TL<sub>m</sub>/fresh water  
30 µg/48 hr/bluegill/TL<sub>m</sub>/fresh water (becomes bound to soil when used according to directions)
- 6.2 **Waterfowl Toxicity:** LD<sub>50</sub> = 3.54 mg/kg LC<sub>50</sub> = 5 days, 90 ppm mallard duck LC<sub>50</sub> = 7 days, 68 ppm quail
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; wettable powders; a variety of emulsifiable solutions in combustible solvents.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 304.4
- 9.3 **Boiling Point at 1 atm:** Very high; decomposes
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.117 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 35 dynes/cm = 0.035 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -12,000 Btu/lb = -6,500 cal/g = -270 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# DIAZINON

DZN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	70.280	51	0.400	51	1.048	51	4.064
54	70.209	52	0.400	52	1.048	52	4.005
56	70.139	53	0.400	53	1.048	53	3.948
58	70.070	54	0.400	54	1.048	54	3.892
60	70.000	55	0.400	55	1.048	55	3.836
62	69.929	56	0.400	56	1.048	56	3.782
64	69.860	57	0.400	57	1.048	57	3.729
66	69.790	58	0.400	58	1.048	58	3.677
68	69.730	59	0.400	59	1.048	59	3.625
70	69.660	60	0.400	60	1.048	60	3.575
72	69.589	61	0.400	61	1.048	61	3.525
74	69.520	62	0.400	62	1.048	62	3.476
76	69.450	63	0.400	63	1.048	63	3.428
78	69.379	64	0.400	64	1.048	64	3.381
80	69.309	65	0.400	65	1.048	65	3.335
82	69.240	66	0.400	66	1.048	66	3.290
84	69.169	67	0.400	67	1.048	67	3.245
86	69.099	68	0.400	68	1.048	68	3.201
		69	0.400	69	1.048	69	3.158
		70	0.400	70	1.048	70	3.116
		71	0.400	71	1.048	71	3.074
		72	0.400	72	1.048	72	3.033
		73	0.400	73	1.048	73	2.993
		74	0.400	74	1.048	74	2.954
		75	0.400	75	1.048	75	2.915
		76	0.400	76	1.048	76	2.877

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.004		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# DI-(P-CHLOROBENZOYL) PEROXIDE

DZP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cadox PS p,p'-Chlorobenzoyl peroxide p-Chlorobenzoyl peroxide Bis-(p-Chlorobenzoyl) peroxide Di-(4-chlorobenzoyl) peroxide p,p'-Dichlorobenzoyl peroxide	Solid or paste  White  Odorless  Sinks in water.
<b>Evacuate.</b> <b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	May explode on contact with combustibles. POISONOUS GASES ARE PRODUCED IN FIRE. Combat fires from safe distance or protected location. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Do not burn  
Keep away from organic matter

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (p-ClC<sub>6</sub>H<sub>4</sub>COO)<sub>2</sub>  
2.3 IMO/UN Designation: 1/0149 (>70%);  
5.2/1531 (>10% or >30% water)  
2.4 DOT ID No.: Currently not available.  
2.5 CAS Registry No.: 94-17-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification:  
51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves; protective clothing.  
3.2 **Symptoms Following Exposure:** Irritates eyes and (on prolonged contact) skin. Ingestion causes irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** EYES: wash with water for at least 15 min.; consult a doctor. SKIN: wash with soap and water. INGESTION: induce vomiting and call a doctor.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Flood with water, or use dry chemical, foam, carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic chlorinated biphenyls are formed in fires.  
4.6 **Behavior in Fire:** Solid may explode. Burns very rapidly when ignited. Smoke is unusually heavy when paste form is involved.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May react vigorously with combustible materials.  
5.3 **Stability During Transport:** Stable if below 80°F.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Dry; wet with more than 30% water; 50% paste with silicone fluid.  
7.2 **Storage Temperature:** Below 80°F  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Organic Peroxide  
8.2 **49 CFR Class:** 5.2  
8.3 **49 CFR Package Group:** Currently not available.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 311.1  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** > 1.1 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -9,000 Btu/lb =  
-5,000 cal/g = -210 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# DI-(P-CHLOROBENZOYL) PEROXIDE

DZP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ETHYL ACETOACETATE

EAA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetoacetic acid, ethyl ester Acetoacetic ester Diacetic ether EAA Ethyl 3-oxobutanoate	Liquid  Colorless  Pleasant fruity odor  Mixes with water.
Keep people away. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{COCH}_2\text{COOC}_2\text{H}_5$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 141-97-9  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves.  
3.2 Symptoms Following Exposure: Liquid may cause mild irritation of eyes.  
3.3 Treatment of Exposure: EYES: flush with water for 15 min.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; oral  $\text{LD}_{50} = 3,980 \text{ mg/kg}$  (rat).  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 176°F O.C. 135°F C.C.  
4.2 Flammable Limits in Air: 1.4% 9.5%  
4.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 563°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: 2.4 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 33.3 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 11.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 98+%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 130.1  
9.3 Boiling Point at 1 atm: 363°F = 184°C = 457°K  
9.4 Freezing Point: < -112°F = < -80°C = <193°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.028 at 20°C (liquid)  
9.8 Liquid Surface Tension: 32.5 dynes/cm = 0.035 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 35 dynes/cm = 0.035 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: 4.48  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: 160 Btu/lb = 91 cal/g =  $3.8 \times 10^5 \text{ J/kg}$   
9.13 Heat of Combustion: -9,349 Btu/lb = -5,194 cal/g =  $-217.3 \times 10^5 \text{ J/kg}$   
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ETHYL ACETOACETATE

EAA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	65.349	35	0.432	42	1.081	34	4.414
36	65.280	40	0.435	44	1.081	36	4.161
38	65.209	45	0.439	46	1.081	38	3.925
40	65.139	50	0.442	48	1.081	40	3.705
42	65.070	55	0.445	50	1.081	42	3.498
44	65.000	60	0.449	52	1.081	44	3.304
46	64.929	65	0.452	54	1.081	46	3.122
48	64.860	70	0.455	56	1.081	48	2.952
50	64.790	75	0.459	58	1.081	50	2.792
52	64.719	80	0.462	60	1.081	52	2.642
54	64.660	85	0.465	62	1.081	54	2.501
56	64.589	90	0.469	64	1.081	56	2.369
58	64.520	95	0.472	66	1.081	58	2.245
60	64.450	100	0.475	68	1.081	60	2.128
62	64.379	105	0.479	70	1.081	62	2.018
64	64.309	110	0.482	72	1.081	64	1.914
66	64.240	115	0.485	74	1.081	66	1.816
68	64.169	120	0.489	76	1.081	68	1.725
70	64.099			78	1.081	70	1.638
72	64.030			80	1.081	72	1.556
74	63.960			82	1.081	74	1.479
76	63.890			84	1.081	76	1.407
78	63.820			86	1.081		
80	63.750			88	1.081		
82	63.680						
84	63.620						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
62	13.000	130	0.208	130	0.00429		N
		140	0.268	140	0.00541		O
		150	0.341	150	0.00678		T
		160	0.431	160	0.00843		
		170	0.541	170	0.01042		P
		180	0.674	180	0.01277		E
		190	0.834	190	0.01556		R
		200	1.025	200	0.01884		T
		210	1.253	210	0.02268		I
		220	1.522	220	0.02714		N
		230	1.839	230	0.03231		E
		240	2.209	240	0.03826		N
		250	2.640	250	0.04508		T
		260	3.139	260	0.05287		
		270	3.716	270	0.06171		
		280	4.378	280	0.07173		
		290	5.135	290	0.08302		
		300	5.999	300	0.09571		
		310	6.979	310	0.10990		
		320	8.089	320	0.12570		
		330	9.339	330	0.14330		
		340	10.740	340	0.16280		
		350	12.320	350	0.18440		
		360	14.080	360	0.20810		

# ETHYL ACRYLATE

EAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acrylic acid, ethyl ester Ethyl 2-propenoate	Liquid                      Colorless                      Fruity odor  Floats on water. Flammable, irritating vapor is produced.
Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from safe distance or protected location. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause headache or nausea. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Contain  
 Collection Systems: Skim  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 14; Acrylate  
 2.2 Formula:  $\text{CH}_2 = \text{CHCOOCH}_2\text{CH}_3$   
 2.3 IMO/UN Designation: 3.2/1917  
 2.4 DOT ID No.: 1917  
 2.5 CAS Registry No.: 140-88-5  
 2.6 NAERG Guide No.: 129P  
 2.7 Standard Industrial Trade Classification: 51379

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister or air-supplied mask; acid goggles; impervious gloves.
- 3.2 **Symptoms Following Exposure:** May cause irritation and burns of eyes and skin. Exposure to excessive vapor concentrations can also cause drowsiness accompanied by nausea, headache, or extreme irritation of the respiratory tract.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air and administer artificial respiration if necessary. SKIN AND EYES: wash for 15 min. with copious quantities of water. Call a physician.
- 3.4 **TLV-TWA:** 5 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 15 ppm.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Repeated exposure may develop sensitivity.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** 0.00024 ppm
- 3.13 **IDLH Value:** 300 ppm
- 3.14 **OSHA PEL-TWA:** 25 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 44°F O.C.
- 4.2 **Flammable Limits in Air:** 1.8%-9.5% (calc.)
- 4.3 **Fire Extinguishing Agents:** Dry chemical, foam or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors generated when heated.
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. May polymerize and cause container to explode.
- 4.7 **Auto Ignition Temperature:** 721°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 4.3 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** May occur; exclude moisture, light; avoid exposure to high temperatures; store in presence of air.
- 5.6 **Inhibitor of Polymerization:** 13-17 ppm monomethyl ether of hydroquinone

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 12 ppm/24 hrs/brine shrimp/TL<sub>m</sub>
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 66% of theoretical in 5 days, freshwater, acclimated seed
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: T  
 Damage to living resources: 3  
 Human Oral hazard: 2  
 Human Contact hazard: I  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** A
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 2              |
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** U113
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 100.12
- 9.3 **Boiling Point at 1 atm:** 211.3°F = 99.6°C = 372.8°K
- 9.4 **Freezing Point:** -98°F = -72°C = 201°K
- 9.5 **Critical Temperature:** 534.2°F = 279°C = 552.2°K
- 9.6 **Critical Pressure:** 544 psia = 37 atm = 3.7 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.923 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 25 dynes/cm = 0.025 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.080
- 9.12 **Latent Heat of Vaporization:** 149 Btu/lb = 82.9 cal/g = 3.47 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -11,880 Btu/lb = -6600 cal/g = -276.3 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** -335 Btu/lb = -186 cal/g = -7.79 X 10<sup>5</sup> J/kg
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 1.4 psia

### NOTES

# ETHYL ACRYLATE

EAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	58.940	35	0.441	0	1.275	35	0.742
40	58.750	40	0.443	10	1.257	40	0.712
45	58.560	45	0.444	20	1.239	45	0.684
50	58.370	50	0.446	30	1.221	50	0.658
55	58.170	55	0.448	40	1.203	55	0.633
60	57.980	60	0.449	50	1.185	60	0.609
65	57.790	65	0.451	60	1.167	65	0.587
70	57.600	70	0.453	70	1.149	70	0.566
75	57.410	75	0.454	80	1.131	75	0.547
80	57.220	80	0.456	90	1.114	80	0.528
85	57.030	85	0.458	100	1.096	85	0.510
90	56.840	90	0.459	110	1.078	90	0.493
95	56.650	95	0.461	120	1.060	95	0.477
100	56.460	100	0.463	130	1.042	100	0.462
		105	0.464	140	1.024		
		110	0.466	150	1.006		
		115	0.468	160	0.988		
		120	0.469	170	0.970		
		125	0.471	180	0.952		
		130	0.473	190	0.934		
		135	0.474	200	0.916		
		140	0.476	210	0.899		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.000	40	0.221	40	0.00412	0	0.243
		50	0.308	50	0.00563	25	0.253
		60	0.423	60	0.00759	50	0.262
		70	0.574	70	0.01011	75	0.272
		80	0.770	80	0.01332	100	0.281
		90	1.023	90	0.01736	125	0.290
		100	1.346	100	0.02242	150	0.299
		110	1.752	110	0.02869	175	0.308
		120	2.261	120	0.03638	200	0.317
		130	2.893	130	0.04575	225	0.326
		140	3.670	140	0.05709	250	0.335
		150	4.621	150	0.07069	275	0.343
		160	5.775	160	0.08692	300	0.351
		170	7.165	170	0.10610	325	0.359
		180	8.831	180	0.12880	350	0.368
		190	10.810	190	0.15530	375	0.375
		200	13.160	200	0.18610	400	0.383
		210	15.930	210	0.22180	425	0.391
						450	0.398
						475	0.406
						500	0.413
						525	0.420
						550	0.427
						575	0.434
						600	0.440

# ETHYLALUMINUM DICHLORIDE

EAD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aluminum ethyl dichloride EADC		Liquid heated  Colorless to light yellow  IGNITES WHEN EXPOSED TO AIR. Reacts violently with water. Poisonous gas is produced on contact with water. Freezing point is 90°F.
Evacuate. Keep people away. Avoid inhalation. Shut off ignition sources and call fire department. Wear goggles and self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	IGNITES WHEN EXPOSED TO AIR. Irritating gases are produced when heated. Extinguish with dry graphite, soda ash, or other inert powder. DO NOT USE WATER, FOAM, CARBON DIOXIDE, DRY CHEMICAL OR VAPORIZING LIQUID ON FIRE. DO NOT USE WATER ON ADJACENT FIRES.	
<b>Exposure</b>	CALL FOR MEDICAL AID. GAS PRODUCED IN REACTION WITH WATER. POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID (HEATED) Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Chemical and Physical Treatment: Neutralize Do not add water to undissolved material	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>2</sub> H <sub>5</sub> AlCl <sub>2</sub> 2.3 IMO/UN Designation: 4.2/1924 2.4 DOT ID No.: Not listed. 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51550
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Full protective clothing, preferably of aluminized glass cloth; goggles, face shield, gloves; in case of fire, all-purpose canister or self-contained breathing apparatus. 3.2 <b>Symptoms Following Exposure:</b> Inhalation of smoke from fire causes metal-fume fever (flu-like symptoms); acid fumes irritate nose and throat. Contact with liquid (which is spontaneously flammable) causes severe burns of eyes and skin. 3.3 <b>Treatment of Exposure:</b> INHALATION: only fumes from fire need be considered; metal-fume fever is not critical and lasts less than 36 hrs.; irritation of nose and throat by acid vapors may require treatment by a physician. EYES: flush gently with water for 15 min.; treat burns if fire occurred; get medical attention. SKIN: wash with water; treat burns caused by fire; get medical attention. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Currently not available. 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Metal-fume fever may develop after breathing smoke from fire. 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes. 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (ignites spontaneously)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Inert dry powders such as dry graphite, soda ash, sand, limestone.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam, dry chemicals, halogenated agents, or carbon dioxide
- 4.5 **Special Hazards of Combustion**  
**Products:** Intense smoke may cause metal-fume fever. Irritating hydrogen chloride also formed.
- 4.6 **Behavior in Fire:** Contact with water applied to adjacent fires will cause formation of irritating smoke containing aluminum oxide and hydrogen chloride.
- 4.7 **Auto Ignition Temperature:** Ignites spontaneously in air at ambient temperature.
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 20.2 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently to form hydrogen chloride fumes and flammable ethane gas.
- 5.2 **Reactivity with Common Materials:**  
Reacts with surface moisture to generate hydrogen chloride, which is corrosive to common metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure (neat) 25% or less by weight in benzene, hexane, or heptane. Solutions are not pyrophoric.
- 7.2 **Storage Temperature:** 35-40°C
- 7.3 **Inert Atmosphere:** Inerted; dry nitrogen at 5 psig.
- 7.4 **Venting:** Safety relief with rupture disc.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 3              |
| Special (White).....      | W              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 130.0
- 9.3 **Boiling Point at 1 atm:** 381°F = 194°C = 467°K
- 9.4 **Freezing Point:** 90°F = 32°C = 305°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.227 at 35°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.030 N/m at 35°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -5,600 Btu/lb = -3,100 cal/g = -130 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# ETHYLALUMINUM DICHLORIDE

EAD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
100	76.360	96	0.460	96	1.048	100	1.918
105	76.099	97	0.460	97	1.048	105	1.828
110	75.839	98	0.460	98	1.048	110	1.743
115	75.580	99	0.460	99	1.048	115	1.663
120	75.320	100	0.460	100	1.048	120	1.589
125	75.059	101	0.460	101	1.048	125	1.518
130	74.799	102	0.460	102	1.048	130	1.453
135	74.540	103	0.460	103	1.048	135	1.391
140	74.280	104	0.460	104	1.048	140	1.332
145	74.020	105	0.460	105	1.048	145	1.277
150	73.759	106	0.460	106	1.048	150	1.225
155	73.500	107	0.460	107	1.048	155	1.176
160	73.240	108	0.460	108	1.048	160	1.130
165	72.980	109	0.460	109	1.048	165	1.086
170	72.719	110	0.460	110	1.048	170	1.045
175	72.459	111	0.460	111	1.048	175	1.005
		112	0.460	112	1.048		
		113	0.460	113	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	130	0.072	130	0.00148		N
	E	140	0.097	140	0.00195		O
	A	150	0.129	150	0.00256		T
	C	160	0.170	160	0.00332		
	T	170	0.222	170	0.00427		P
	S	180	0.288	180	0.00545		E
		190	0.370	190	0.00690		R
		200	0.472	200	0.00867		I
		210	0.598	210	0.01082		N
		220	0.753	220	0.01342		E
		230	0.941	230	0.01652		N
		240	1.169	240	0.02023		T
		250	1.442	250	0.02462		
		260	1.770	260	0.02979		
		270	2.160	270	0.03585		
		280	2.621	280	0.04292		
		290	3.165	290	0.05113		
		300	3.803	300	0.06062		
		310	4.547	310	0.07155		
		320	5.412	320	0.08407		
		330	6.414	330	0.09836		
		340	7.568	340	0.11460		
		350	8.894	350	0.13300		

# 2-ETHYLHEXYL ACRYLATE

EAI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acrylic acid, 2-ethylhexylester 2-Ethylhexyl-2-propenoate		Liquid	Colorless	Sharp odor
		Floats on water.		
Keep people away. Avoid inhalation. Call fire department. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Combustible. Containers may explode in fire. Combat fires from safe distance or protected location. Extinguish with dry chemicals or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.			
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators or nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 14; Acrylate  
2.2 Formula:  $\text{CH}_2=\text{CHCOOCH}_2\text{CH}(\text{C}_4\text{H}_9)(\text{CH}_2)_5\text{CH}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 103-11-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51379

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; rubber gloves; vapor-proof chemical safety goggles; impervious apron and boots.  
3.2 **Symptoms Following Exposure:** Inhalation of concentrated vapor causes drowsiness and convulsions. Liquid causes irritation of eyes and may irritate skin on prolonged exposure. Ingestion produces same symptoms as inhalation.  
3.3 **Treatment of Exposure:** INHALATION: give artificial respiration and oxygen if necessary; call a physician. EYES: immediately flush with plenty of water for at least 15 min.; get medical attention. SKIN: immediately flush with plenty of water for at least 15 min. INGESTION: induce vomiting and consult a physician.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat  $\text{LD}_{50}$  = 1,540 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 195°F O.C.  
4.2 **Flammable Limits in Air:** 0.8%-6.4%  
4.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Heat can result in a severe polymerization with rapid release of energy. Sealed containers may rupture explosively if hot.  
4.7 **Auto Ignition Temperature:** 496°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 4.6 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 71.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 21.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Will polymerize in the absence of inhibitor and when heated.  
5.6 **Inhibitor of Polymerization:** Monomethyl ether of hydroquinone, 13-120 ppm. Hydroquinone, 90-120 ppm.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 72 ppm/24 hr/ brine shrimp/TL<sub>m</sub>  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 9% of theoretical in 5 days, fresh water, acclimated seed  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** <100°F (38°C)  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	1

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 184.2  
9.3 **Boiling Point at 1 atm:** (polymerizes) 471°F = 214°C = 487°K  
9.4 **Freezing Point:** -130°F = -90°C = 183°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.885 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 110 Btu/lb = 61 cal/g = 2.6 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -15,500 Btu/lb = -8,600 cal/g = 360 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** -142 Btu/lb = -79 cal/g = -3.3 X 10<sup>5</sup> J/kg  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.01 psia

### NOTES

# 2-ETHYLHEXYL ACRYLATE

EAI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
15	56.900	35	0.402	42	1.048	15	3.699
20	56.740	40	0.404	44	1.048	20	3.434
25	56.590	45	0.407	46	1.048	25	3.192
30	56.430	50	0.410	48	1.048	30	2.972
35	56.270	55	0.413	50	1.048	35	2.771
40	56.120	60	0.416	52	1.048	40	2.587
45	55.960	65	0.418	54	1.048	45	2.419
50	55.810	70	0.421	56	1.048	50	2.264
55	55.650	75	0.424	58	1.048	55	2.122
60	55.490	80	0.427	60	1.048	60	1.992
65	55.340	85	0.429	62	1.048	65	1.872
70	55.180	90	0.432	64	1.048	70	1.761
75	55.030	95	0.435	66	1.048	75	1.659
80	54.870	100	0.438	68	1.048	80	1.564
85	54.710	105	0.441	70	1.048	85	1.476
90	54.560	110	0.443	72	1.048	90	1.395
95	54.400	115	0.446	74	1.048	95	1.319
100	54.250	120	0.449	76	1.048	100	1.249
105	54.090					105	1.184
110	53.930					110	1.123
115	53.780					115	1.066
120	53.620					120	1.013

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.340	100	0.011	100	0.00035	N O T  P E R T I N E N T	
		120	0.022	120	0.00067		
		140	0.043	140	0.00122		
		160	0.077	160	0.00214		
		180	0.135	180	0.00363		
		200	0.229	200	0.00595		
		220	0.375	220	0.00947		
		240	0.598	240	0.01466		
		260	0.928	260	0.02213		
		280	1.408	280	0.03266		
		300	2.088	300	0.04717		
		320	3.036	320	0.06682		
		340	4.332	340	0.09297		
		360	6.075	360	0.12720		
		380	8.384	380	0.17130		
		400	11.400	400	0.22750		
		420	15.280	420	0.29800		
		440	20.220	440	0.38560		
		460	26.420	460	0.49300		

# ETHYL AMYL KETONE

EAK

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Amyl ethyl ketone 3-Octanone UN 2271 (DOT)	Liquid	Colorless	Mild fruity odor
<p>Keep people away. Avoid inhalation. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.</p>			
<b>Fire</b>	<p>Combustible. Water may be ineffective on fire. Extinguish with dry chemical, alcohol foam or CO<sub>2</sub>. Cool exposed containers with water.</p>		
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.</p>		
<b>Water Pollution</b>	<p>Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 18; Ketones  
2.2 Formula: CH<sub>3</sub>(CH<sub>2</sub>)<sub>4</sub>COC<sub>2</sub>H<sub>5</sub>  
2.3 IMO/UN Designation: 3.3/2271  
2.4 DOT ID No.: 2271  
2.5 CAS Registry No.: 106-68-3  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion or skin absorption. Vapor or mist is irritating to eyes, mucous membrane and upper respiratory tract. Causes skin irritation.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with copious amount of water for at least 15 minutes. SKIN: Wash skin with soap and copious amount of water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 0.406 g/kg (mouse, intraperitoneal)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 115°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Vapor may travel considerable distance to a source of ignition and flash back.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 54.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** No reaction.
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not occur.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 2  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable Liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 128.22
- 9.3 **Boiling Point at 1 atm:** 332.6-334.4°F = 167-168°C = 440.2-441.2°K
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.822
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 4.42
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYL AMYL KETONE

EAK

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	51.080		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  M I S C I B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.327 0.341 0.354 0.367 0.380 0.393 0.406 0.418 0.430 0.442 0.453 0.465 0.476 0.487 0.498 0.508 0.519 0.529 0.539 0.548 0.558 0.568 0.577 0.586 0.595

# ETHYL ALCOHOL

EAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Alcohol Cologne spirit Denatured alcohol Ethanol Fermentation alcohol Grain alcohol	Watery liquid      Colorless      Alcohol odor  Floats and mixes with water. Flammable, irritating vapor is produced.
Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air.  LIQUID Not harmful.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
 2.2 Formula: C<sub>2</sub>H<sub>5</sub>OH  
 2.3 IMO/UN Designation: 3.2/1170  
 2.4 DOT ID No.: 1170  
 2.5 CAS Registry No.: 64-17-5  
 2.6 NAERG Guide No.: 127  
 2.7 Standard Industrial Trade Classification: 51215

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** All-purpose canister; safety goggles. Avoid contact with liquid and inhalation of vapors.  
 3.2 **Symptoms Following Exposure:** Irritation of eyes, nose and throat. Headache and drowsiness may occur. Liquid causes intoxication.  
 3.3 **Treatment of Exposure:** INHALATION: if breathing is affected, remove victim to fresh air; call physician; administer oxygen. Speed is of primary importance. EYES OR SKIN: flush with water.  
 3.4 **TLV-TWA:** 1,000 ppm  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
 3.12 **Odor Threshold:** 10 ppm  
 3.13 **IDLH Value:** 3,300 ppm  
 3.14 **OSHA PEL-TWA:** 1,000 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 64°F O.C. 55°F C.C.  
 4.2 **Flammable Limits in Air:** 3.3%-19%  
 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, water spray, alcohol foam  
 4.4 **Fire Extinguishing Agents Not to Be Used:** None  
 4.5 **Special Hazards of Combustion Products:** None  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 689°F  
 4.8 **Electrical Hazards:** Class I, Group D  
 4.9 **Burning Rate:** 3.9 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 14.3 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOC):** N<sub>2</sub> diluent: 10.5-10.6%; CO<sub>2</sub> diluent: 13.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 250 ppm/6 hr/goldfish/lethal/fresh water  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** 125%, 5 days; 44.2% (theor.), 5 days; 71.2% (theor.), 20 days  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 0  
 Human Oral hazard: 0  
 Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Anhydrous (200 proof); 190 proof; specially denatured; completely denatured  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	3
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 46.07  
 9.3 **Boiling Point at 1 atm:** 172.9°F = 78.3°C = 351.5°K  
 9.4 **Freezing Point:** -173°F = -114°C = 159°K  
 9.5 **Critical Temperature:** 469.6°F = 243.1°C = 516.3°K  
 9.6 **Critical Pressure:** 926 psia = 63.0 atm = 6.38 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.790 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** Not pertinent  
 9.9 **Liquid Water Interfacial Tension:** Not pertinent  
 9.10 **Vapor (Gas) Specific Gravity:** 1.6  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.128  
 9.12 **Latent Heat of Vaporization:** 360 Btu/lb = 200 cal/g =  
 9.13 **Heat of Combustion:** 8.37 X 10<sup>5</sup> J/kg  
 -11,570 Btu/lb = 6425 cal/g = -268.8 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** -99 Btu/lb = -55 cal/g = -2.3 X 10<sup>5</sup> J/kg  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 2.3 psia

### NOTES

# ETHYL ALCOHOL

EAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	50.220	35	0.539	-40	1.289	N O T  P E R T I N E N T	
40	50.080	40	0.545	-30	1.277		
45	49.930	45	0.552	-20	1.265		
50	49.780	50	0.558	-10	1.253		
55	49.630	55	0.564	0	1.242		
60	49.490	60	0.571	10	1.230		
65	49.340	65	0.577	20	1.218		
70	49.190	70	0.583	30	1.206		
75	49.040	75	0.590	40	1.194		
80	48.900	80	0.596	50	1.182		
85	48.750	85	0.603	60	1.171		
90	48.600	90	0.609	70	1.159		
95	48.460	95	0.615	80	1.147		
100	48.310	100	0.622	90	1.135		
105	48.160	105	0.628	100	1.123		
110	48.010	110	0.635	110	1.112		
115	47.870	115	0.641	120	1.100		
120	47.720	120	0.647	130	1.088		
125	47.570						
130	47.420						
135	47.280						
140	47.130						
145	46.980						
150	46.830						
155	46.690						
160	46.540						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		40	0.304	40	0.00261	0	0.351
		50	0.441	50	0.00371	25	0.362
		60	0.629	60	0.00520	50	0.373
		70	0.884	70	0.00716	75	0.384
		80	1.224	80	0.00973	100	0.395
		90	1.671	90	0.01305	125	0.406
		100	2.253	100	0.01728	150	0.417
		110	3.001	110	0.02261	175	0.427
		120	3.952	120	0.02926	200	0.437
		130	5.148	130	0.03747	225	0.447
		140	6.640	140	0.04752	250	0.457
		150	8.482	150	0.05971	275	0.467
		160	10.740	160	0.07438	300	0.477
		170	13.480	170	0.09188	325	0.487
		180	16.790	180	0.11260	350	0.496
		190	20.740	190	0.13700	375	0.505
		200	25.450	200	0.16560	400	0.514
		210	31.010	210	0.19870	425	0.523
						450	0.532
						475	0.541
						500	0.549
						525	0.558
						550	0.566
						575	0.574
						600	0.582

# ETHYLAMINE

EAM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aminoethane Monoethylamine	Liquid  Colorless  Strong ammonia-like odor  Mixes with water. Boiling point is 62°F. Flammable, irritating vapor is produced.
<b>Keep people away.</b> Avoid inhalation. Shut off ignition sources. Call fire department. Evacuate area in case of large discharge. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Irritating gases are produced when heated. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
<b>Water Pollution</b>	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 7; Aliphatic amines  
2.2 **Formula:** C<sub>2</sub>H<sub>5</sub>NH<sub>2</sub>  
2.3 **IMO/UN Designation:** 2/1036 (Gas) 2/2270 (50-70% Solution)  
2.4 **DOT ID No.:** 1036 (Gas) 2270 (50-70% Solution)  
2.5 **CAS Registry No.:** 75-04-7  
2.6 **NAERG Guide No.:** 118 (gas); 132 (solution)  
2.7 **Standard Industrial Trade Classification:** 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Amine-type or ammonia-type mask; plastic gloves; face shield and goggles.  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory tract and lungs; pulmonary edema may result. Liquid causes severe irritation and burns of eyes and skin, and can permanently injure eyes after 15 seconds' contact. Ingestion causes severe burns of mouth and stomach; can be fatal.  
3.3 **Treatment of Exposure:** Get prompt medical attention for anyone overcome or injured by exposure to this compound. INHALATION: remove victim to fresh air, keep him warm, and administer oxygen until medical help arrives. EYES: wash for 15 min. with water; avoid pressure on eyelids. SKIN: wash with soap and water; do not use ointments for at least 24 hrs.; do not cover burned area with dry clothing; keep moist with physiological saline solution. INGESTION: if victim is conscious, give large amount of water, then induce vomiting.  
3.4 **TLV-TWA:** 5 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 15 ppm.  
3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 400 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 600 ppm  
3.14 **OSHA PEL-TWA:** 10 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 0°F O.C.  
4.2 **Flammable Limits in Air:** 3.5%-14%  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Irritating and toxic oxides of nitrogen may be formed.  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. Containers may explode when heated.  
4.7 **Auto Ignition Temperature:** 724°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 5.0 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 22.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Will strip and dissolve paint; dissolves most plastic materials; can cause swelling of rubber by absorption. The reactions are not hazardous.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 40 ppm/24 hr/chub/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Anhydrous (98.5+%); 70-72% in water  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** (C)  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid or Flammable gas  
8.2 **49 CFR Class:** 3 or 2.1  
8.3 **49 CFR Package Group:** II or not pertinent  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	4
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 45.1  
9.3 **Boiling Point at 1 atm:** 61.7°F = 16.5°C = 289.7°K  
9.4 **Freezing Point:** -114°F = -81°C = 192°K  
9.5 **Critical Temperature:** 361.4°F = 183°C = 456.2°K  
9.6 **Critical Pressure:** 827 psia = 56.2 atm = 5.70 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.687 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** 20.5 dynes/cm = 0.0205 N/m at 15°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 1.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1181  
9.12 **Latent Heat of Vaporization:** 253 Btu/lb = 146 cal/g = 6.11 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -16,180 Btu/lb = -8,990 cal/g = -376 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 29.8 psia

### NOTES



# ETHYLAMINE

EAM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	45.340	0	0.645	0	1.295	0	0.364
10	44.920	5	0.648	5	1.282	5	0.351
20	44.510	10	0.652	10	1.268	10	0.339
30	44.090	15	0.655	15	1.255	15	0.328
40	43.670	20	0.658	20	1.242	20	0.317
50	43.260	25	0.661	25	1.228	25	0.307
60	42.840	30	0.664	30	1.215	30	0.298
		35	0.667	35	1.201	35	0.289
		40	0.670	40	1.188	40	0.280
		45	0.673	45	1.174	45	0.272
		50	0.676	50	1.161	50	0.264
		55	0.679	55	1.148	55	0.257
		60	0.682	60	1.134	60	0.250

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	-20	0.080	-20	0.00076	0	0.385
	I	-15	0.116	-15	0.00109	25	0.397
	S	-10	0.166	-10	0.00156	50	0.409
	C	-5	0.238	-5	0.00220	75	0.420
	I	0	0.337	0	0.00308	100	0.432
	B	5	0.474	5	0.00429	125	0.443
	L	10	0.662	10	0.00592	150	0.455
	E	15	0.919	15	0.00813	175	0.466
		20	1.265	20	0.01108	200	0.478
		25	1.731	25	0.01501	225	0.490
		30	2.354	30	0.02020	250	0.501
		35	3.180	35	0.02701	275	0.513
		40	4.271	40	0.03592	300	0.524
		45	5.703	45	0.04748	325	0.536
		50	7.572	50	0.06242	350	0.547
		55	9.998	55	0.08161	375	0.559
		60	13.130	60	0.10620	400	0.571
		65	17.160	65	0.13740	425	0.582
		70	22.300	70	0.17690	450	0.594
		75	28.850	75	0.22670	475	0.605
		80	37.140	80	0.28910	500	0.617
		85	47.590	85	0.36710	525	0.629
						550	0.640
						575	0.652
						600	0.663

# ETHYLALUMINUM SESQUICHLORIDE

EAS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> EASC	Liquid  Colorless to yellow  IGNITES WHEN EXPOSED TO AIR. Reacts violently with water. Poisonous and flammable gases are produced on contact with water.
Evacuate. Keep people away. Avoid inhalation. Shut off ignition sources and call fire department. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	IGNITES WHEN EXPOSED TO AIR. If in water, let fire burn. If not in water, extinguish with dry graphite, soda ash, or other inert powder. DO NOT USE WATER, FOAM, CARBON DIOXIDE, DRY CHEMICALS OR VAPORIZING LIQUIDS ON FIRE. DO NOT USE WATER ON ADJACENT FIRES.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. or milk. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** (C<sub>2</sub>H<sub>5</sub>)<sub>3</sub>AlCl<sub>3</sub>  
2.3 **IMO/UN Designation:** 4.2/1925  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full protective clothing, preferably of aluminized glass cloth; goggles, face shield, gloves; in case of fire, all-purpose canister or self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** Inhalation of smoke from fire causes metal-fume fever (flu-like symptoms); acid fumes irritate nose and throat. Contact with liquid, which is spontaneously flammable, causes severe burns of eyes and skin.
- 3.3 **Treatment of Exposure:** INHALATION: only fumes from fire need be considered; metal-fume fever is not critical and lasts less than 36 hrs.; irritation of nose and throat by acid vapors may require treatment by a physician. EYES: flush gently with water for 15 min.; treat burns if fire occurred; get medical attention. SKIN: wash with water; treat burns caused by fire; get medical attention.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Metal-fume fever may develop after breathing smoke from fire.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (ignites spontaneously)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Inert dry powders such as dry graphite, soda ash, sand or limestone
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam, dry chemicals, halogenated agents, or carbon dioxide
- 4.5 **Special Hazards of Combustion Products:** Intense smoke may cause metal-fume fever. Irritating hydrogen chloride also formed.
- 4.6 **Behavior in Fire:** Contact with water from adjacent fires will cause formation of irritating smoke containing aluminum oxide and hydrogen chloride.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 17.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently to form hydrogen chloride fumes and flammable ethane gas.
- 5.2 **Reactivity with Common Materials:**  
Reacts with surface moisture to generate hydrogen chloride, which is corrosive to common metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure (neat); 25% or less by weight in benzene, hexane, or heptane. Solutions are not pyrophoric.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Inerted; dry nitrogen at 5 psig.
- 7.4 **Venting:** Safety relief with rupture disc.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | -              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 3              |
| Special (White).....      | W              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 247.5
- 9.3 **Boiling Point at 1 atm:** 399°F = 204°C = 477°K
- 9.4 **Freezing Point:** -4°F = -20°C = 253°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.092 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 32 dynes/cm = 0.032 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -8,600 Btu/lb = -4,800 cal/g = -200 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYLALUMINUM SESQUICHLORIDE

EAS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	69.799	34	0.441	51	1.048	55	2.327
50	69.349	36	0.442	52	1.048	60	2.204
60	68.900	38	0.443	53	1.048	65	2.089
70	68.450	40	0.444	54	1.048	70	1.982
80	68.000	42	0.446	55	1.048	75	1.883
90	67.549	44	0.447	56	1.048	80	1.790
100	67.099	46	0.448	57	1.048	85	1.704
110	66.650	48	0.449	58	1.048	90	1.623
120	66.190	50	0.450	59	1.048	95	1.547
130	65.740	52	0.451	60	1.048	100	1.476
140	65.290	54	0.452	61	1.048	105	1.409
150	64.839	56	0.453	62	1.048	110	1.347
160	64.389	58	0.454	63	1.048	115	1.288
170	63.940	60	0.456	64	1.048	120	1.233
180	63.490	62	0.457	65	1.048	125	1.181
190	63.040	64	0.458	66	1.048	130	1.132
		66	0.459	67	1.048	135	1.086
		68	0.460	68	1.048	140	1.043
		70	0.461	69	1.048	145	1.001
		72	0.462	70	1.048	150	0.963
		74	0.463	71	1.048	155	0.926
		76	0.464	72	1.048		
		78	0.466	73	1.048		
		80	0.467	74	1.048		
		82	0.468	75	1.048		
		84	0.469	76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	130	0.070	130	0.00274		N
	E	140	0.093	140	0.00356		O
	A	150	0.122	150	0.00460		T
	C	160	0.158	160	0.00589		
	T	170	0.204	170	0.00748		P
	S	180	0.261	180	0.00942		E
		190	0.332	190	0.01179		R
		200	0.419	200	0.01464		T
		210	0.524	210	0.01806		I
		220	0.653	220	0.02214		N
		230	0.807	230	0.02697		E
		240	0.991	240	0.03267		N
		250	1.211	250	0.03935		T
		260	1.471	260	0.04714		
		270	1.778	270	0.05619		
		280	2.138	280	0.06664		
		290	2.558	290	0.07866		
		300	3.045	300	0.09243		
		310	3.610	310	0.10810		
		320	4.260	320	0.12600		
		330	5.007	330	0.14620		
		340	5.861	340	0.16900		
		350	6.833	350	0.19460		

# N-ETHYL-N-BUTYLAMINE

EBA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butylethylamine Ethylbutylamine	Liquid	Water-white	Amine
Floats and mixes with water;			
Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE. Vapors may explode if ignited in an enclosed area. Flashback along vapor trail may occur. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with water fog, carbon dioxide, dry chemical or foam. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_6H_{11}NHC_4H_9$   
2.3 IMO/UN Designation: 3.2/2733  
2.4 DOT ID No.: 2733  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear safety goggles, rubber gloves and apron, respiratory protective equipment, non sparking shoes.  
3.2 **Symptoms Following Exposure:** INHALATION: Irritation of mucous membranes and lungs. EYES: Irritation. Corrosive, may cause blindness - Irreversible. SKIN: Irritation. Corrosive. INGESTION: Nausea and salivation.  
3.3 **Treatment of Exposure:** Get medical aid. INHALATION: Remove to fresh air. If not breathing, give artificial respiration. EYES: Flush with plenty of water for at least 15 minutes. SKIN: Flush with soap and water. INGESTION: Give large amount of water or milk. DO NOT induce vomiting.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3;  $LD_{50} = 50$  to 500 mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 65°F O.C. 56°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray or fog,  $CO_2$ , dry chemical or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** May include nitrogen oxides.  
4.6 **Behavior in Fire:** When exposed to heat or flame, can react vigorously with oxidizing materials.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 51.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 14.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** (C)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 101.2  
9.3 **Boiling Point at 1 atm:** 227.3°F = 108.5°C = 381.7°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** (Est.) 565.7°F = 296.5°C = 569.6°K  
9.6 **Critical Pressure:** (Est.) 440.9 psia = 30 atm = 3.04 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.7398 at 20°C  
9.8 **Liquid Surface Tension:** (Est.) 21 dynes/cm = 0.021 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (Est.) 54 dynes/cm = 0.054 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (Est.) >1 at 20°C (68°F)  
9.12 **Latent Heat of Vaporization:** 153 Btu/lb = 85.0 cal/g = 3.56 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -17431 Btu/lb = - 9684 cal/g = -405 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N-ETHYL-N-BUTYLAMINE

EBA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	46.147		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125	0.052 0.060 0.071 0.083 0.097 0.113 0.132 0.154 0.180 0.211 0.246 0.288 0.336 0.393 0.459 0.537 0.627 0.733 0.857 1.001 1.170 1.367 1.598 1.868 2.183	5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125	0.00096 0.00111 0.00128 0.00147 0.00169 0.00195 0.00224 0.00258 0.00297 0.00342 0.00394 0.00454 0.00523 0.00602 0.00693 0.00798 0.00919 0.01058 0.01218 0.01403 0.01616 0.01860 0.02142 0.02466 0.02840		C U R R E N T L Y  N O T  A V A I L A B L E

# ETHYL BUTYL KETONE

EBK

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butyl ethyl ketone 3-Heptanone	Liquid	Colorless	Mild, fruity odor
<p>Keep people away. Avoid contact with liquid and vapor.                      Avoid inhalation.                      Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).                      Shut off ignition sources and call fire department.                      Notify local health and pollution control agencies.                      Protect water intakes.</p>			
<b>Fire</b>	<p>Combustible.                      Vapors can flow to distant ignition source and flash back.                      Wear full protective clothing with self-contained breathing apparatus.                      Extinguish fire with dry chemical, alcohol foam, or carbon dioxide.                      Use water spray to cool exposed containers.</p>		
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR                      Move victim to fresh air.                      If breathing has stopped, give artificial respiration.                      If breathing is difficult, give oxygen.</p> <p>LIQUID                      Remove contaminated clothing and shoes.                      Wash affected areas with soap and water.                      IF IN EYES, hold eyelids open and flush with plenty of water.                      IF SWALLOWED and victim is CONSCIOUS, have victim drink 1-2 glasses of water and induce vomiting.</p>		
<b>Water Pollution</b>	<p>Effect of low concentrations on aquatic life is unknown.                      May be dangerous if it enters water intakes.                      Notify local health and wildlife officials.                      Notify operators of nearby water intakes.</p>		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
 2.2 Formula: C<sub>7</sub>H<sub>14</sub>O  
 2.3 IMO/UN Designation: Currently not available  
 2.4 DOT ID No.: Not listed.  
 2.5 CAS Registry No.: 106-35-4  
 2.6 NAERG Guide No.: Not listed  
 2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Impervious clothing, gloves, face shield, and other appropriate protective clothing to prevent repeated or prolonged skin contact with liquid material. Use splash proof safety goggles where liquid may contact eyes. Use respiratory protection (approved respirator or self-contained breathing apparatus) where vapors may be encountered.
- 3.2 **Symptoms Following Exposure:** Short term exposure can cause irritation of eyes, nose, throat and lungs. High concentrations may cause headache, dizziness or unconsciousness.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. INGESTION: Give 1 to 2 glasses of water and induce vomiting.
- 3.4 TLV-TWA: 50 ppm  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 Toxicity by Ingestion: Currently not available  
 3.8 Toxicity by Inhalation: Currently not available.  
 3.9 Chronic Toxicity: Chemical is a defatting agent and can cause dermatitis on prolonged exposure. May exacerbate previously existing respiratory, liver, or skin ailments.  
 3.10 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
 3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 Odor Threshold: Currently not available  
 3.13 IDLH Value: 1,000 ppm  
 3.14 OSHA PEL-TWA: 50 ppm  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 115°F O.C.  
 4.2 Flammable Limits in Air: LEL: 1.4%; UEL: 8.8%  
 4.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, or carbon dioxide.  
 4.4 Fire Extinguishing Agents Not to Be Used: Water.  
 4.5 Special Hazards of Combustion Products: Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
 4.6 Behavior in Fire: Currently not available  
 4.7 Auto Ignition Temperature: Currently not available  
 4.8 Electrical Hazards: Will attack some plastics, rubber, and coatings (insulators).  
 4.9 Burning Rate: Currently not available  
 4.10 Adiabatic Flame Temperature: Currently not available  
 4.11 Stoichiometric Air to Fuel Ratio: 47.6 (calc.)  
 4.12 Flame Temperature: Currently not available  
 4.13 Combustion Molar Ratio (Reactant to Product): 14.0 (calc.)  
 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.  
 5.2 Reactivity with Common Materials: Contact with oxidizers can cause fires and explosions.  
 5.3 Stability During Transport: Stable.  
 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.  
 5.5 Polymerization: Will not polymerize.  
 5.6 Inhibitor of Polymerization: Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
 6.2 Waterfowl Toxicity: Currently not available  
 6.3 Biological Oxygen Demand (BOD): Currently not available  
 6.4 Food Chain Concentration Potential: Currently not available  
 6.5 GESAMP Hazard Profile:  
 Bioaccumulation: T  
 Damage to living resources: 2  
 Human Oral hazard: 1  
 Human Contact hazard: 1  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: CP; technical grades.  
 7.2 Storage Temperature: Ambient.  
 7.3 Inert Atmosphere: No requirement.  
 7.4 Venting: Not listed.  
 7.5 IMO Pollution Category: Currently not available  
 7.6 Ship Type: Currently not available  
 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.  
 8.2 49 CFR Class: Not pertinent.  
 8.3 49 CFR Package Group: Not listed.  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
 9.2 Molecular Weight: 114.19  
 9.3 Boiling Point at 1 atm: 297°F = 147°C = 420°K  
 9.4 Freezing Point: -38°F = -39°C = 234°K  
 9.5 Critical Temperature: Currently not available  
 9.6 Critical Pressure: Currently not available  
 9.7 Specific Gravity: 0.818  
 9.8 Liquid Surface Tension: Currently not available  
 9.9 Liquid Water Interfacial Tension: Currently not available  
 9.10 Vapor (Gas) Specific Gravity: 3.93  
 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
 9.12 Latent Heat of Vaporization: Currently not available  
 9.13 Heat of Combustion: Currently not available  
 9.14 Heat of Decomposition: Currently not available  
 9.15 Heat of Solution: Currently not available  
 9.16 Heat of Polymerization: Not pertinent.  
 9.17 Heat of Fusion: Currently not available  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ETHYL BUTYL KETONE

EBK

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.430	68	0.077	68	0.00156		C U R R E N T L Y  N O T  A V A I L A B L E

# ETHYL BUTYRATE

EBR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butyric acid, ethyl ester Butyric ether Ethyl butanoate	Liquid                      Colorless                      Fruity odor  Floats on water.
Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled will cause headache or dizziness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. If swallowed will cause nausea, vomiting, dizziness or headache. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Contain  
 Collection Systems: Skim

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOC}_2\text{H}_5$   
 2.3 IMO/UN Designation: 3.3/1180  
 2.4 DOT ID No.: 1180  
 2.5 CAS Registry No.: 105-54-4  
 2.6 NAERG Guide No.: 129  
 2.7 Standard Industrial Trade Classification: 51375

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** All-purpose canister mask or chemical cartridge respirator; glass or face shield; rubber gloves  
 3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, dizziness, nausea, vomiting, and narcosis. Contact with liquid irritates eyes.  
 3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air and call a physician; give artificial respiration if necessary. INGESTION: induce vomiting and call a physician. EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 1; oral  $\text{LD}_{50} = 13 \text{ g/kg}$  (rat)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** 0.015 ppm  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 85°F O.C. 75°F C.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
 4.5 **Special Hazards of Combustion Products:** Currently not available  
 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back. Containers may explode in fire.  
 4.7 **Auto Ignition Temperature:** 865°F  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** 4.72 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** May attack some forms of plastics  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 2  
 Human Oral hazard: 0  
 Human Contact hazard: I  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial, 98+%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** C  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** III  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	3
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 116.16  
 9.3 **Boiling Point at 1 atm:** 250°F = 121°C = 394°K  
 9.4 **Freezing Point:** -135°F = -93°C = 180°K  
 9.5 **Critical Temperature:** 559.4°F = 293°C = 566.2°K  
 9.6 **Critical Pressure:** 460 psia = 31 atm = 3.2 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.879 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 24.5 dynes/cm = 0.0245 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** 4.0  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** 128 Btu/lb = 71 cal/g =  $3.0 \times 10^5 \text{ J/kg}$   
 9.13 **Heat of Combustion:** -13,200 Btu/lb = -7330 cal/g =  $-306 \times 10^5 \text{ J/kg}$   
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ETHYL BUTYRATE

EBR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	56.050	51	0.460	30	0.987	55	0.733
36	55.980	52	0.460	35	0.983	60	0.706
38	55.910	53	0.460	40	0.979	65	0.680
40	55.840	54	0.460	45	0.974	70	0.656
42	55.770	55	0.460	50	0.970	75	0.633
44	55.700	56	0.460	55	0.965	80	0.611
46	55.630	57	0.460	60	0.961	85	0.590
48	55.560	58	0.460	65	0.957	90	0.570
50	55.490	59	0.460	70	0.952	95	0.552
52	55.420	60	0.460	75	0.948	100	0.534
54	55.350	61	0.460	80	0.943	105	0.517
56	55.290	62	0.460	85	0.939	110	0.501
58	55.220	63	0.460	90	0.935	115	0.485
60	55.150	64	0.460	95	0.930	120	0.471
62	55.080	65	0.460	100	0.926		
64	55.010	66	0.460	105	0.922		
66	54.940	67	0.460	110	0.917		
68	54.870	68	0.460	115	0.913		
70	54.800	69	0.460	120	0.908		
72	54.730	70	0.460	125	0.904		
74	54.660	71	0.460	130	0.900		
76	54.590	72	0.460	135	0.895		
		73	0.460	140	0.891		
		74	0.460	145	0.886		
		75	0.460	150	0.882		
		76	0.460	155	0.878		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.680	60	0.196	60	0.00407		N
		70	0.271	70	0.00553		O
		80	0.369	80	0.00739		T
		90	0.496	90	0.00976		
		100	0.657	100	0.01271		P
		110	0.862	110	0.01637		E
		120	1.116	120	0.02084		R
		130	1.430	130	0.02625		T
		140	1.815	140	0.03275		I
		150	2.281	150	0.04048		N
		160	2.840	160	0.04960		E
		170	3.508	170	0.06029		N
		180	4.299	180	0.07272		T
		190	5.228	190	0.08707		
		200	6.313	200	0.10360		
		210	7.572	210	0.12230		
		220	9.024	220	0.14370		
		230	10.690	230	0.16770		
		240	12.590	240	0.19480		
		250	14.750	250	0.22490		
		260	17.190	260	0.25850		
		270	19.940	270	0.29570		
		280	23.020	280	0.33670		
		290	26.450	290	0.38180		
		300	30.260	300	0.43110		
		310	34.490	310	0.48490		

# ETHYL BUTANOL

EBT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Ethyl-1-butanol 2-Ethylbutyl alcohol sec-Hexyl alcohol sec-Pentylcarbinol Pseudoheptyl alcohol	Liquid                      Colorless                      Mild alcohol odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn eyes. Harmful if swallowed. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment:  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 20; Alcohol, glycol  
 2.2 **Formula:** (C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>CHCH<sub>2</sub>OH  
 2.3 **IMO/UN Designation:** Not listed  
 2.4 **DOT ID No.:** 2275  
 2.5 **CAS Registry No.:** 97-95-0  
 2.6 **NAERG Guide No.:** 129  
 2.7 **Standard Industrial Trade Classification:** 51219

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Fresh-air mask; plastic gloves; coverall goggles; safety shower and eye bath.  
 3.2 **Symptoms Following Exposure:** Liquid causes eye burns. Vapors may be mildly irritating to nose and throat.  
 3.3 **Treatment of Exposure:** Remove to fresh air. Remove contaminated clothing. Wash affected skin areas with water. Flush eyes with water for at least 15 min. and get medical care.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Irritates eyes; moderate irritation of skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 128°F O.C.  
 4.2 **Flammable Limits in Air:** 1.9%-8.8%  
 4.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; alcohol foam for large fires.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 580°F (calc.)  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 9.5% @ 150°C.

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 1  
 Human Oral hazard: 1  
 Human Contact hazard: 1  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Currently not available  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
 7.5 **IMO Pollution Category:** D  
 7.6 **Ship Type:** Data not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** III  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 102.17  
 9.3 **Boiling Point at 1 atm:** 293°F = 146°C = 419°K  
 9.4 **Freezing Point:** -173°F = -114°C = 159°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.834 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 24.3 dynes/cm = 0.0243 N/m at 25°C  
 9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** 196.0 Btu/lb = 108.9 cal/g = 4.559 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** (est.) = -16,600 Btu/lb = -9,250 cal/g = -387 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 0.07 psia

### NOTES

# ETHYL BUTANOL

EBT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	53.240	32	0.540	50	1.109	50	0.878
36	53.170	34	0.540	52	1.109	52	0.862
38	53.100	36	0.540	54	1.109	54	0.846
40	53.030	38	0.540	56	1.109	56	0.831
42	52.960	40	0.540	58	1.109	58	0.817
44	52.890	42	0.540	60	1.109	60	0.802
46	52.820	44	0.540	62	1.109	62	0.788
48	52.750	46	0.540	64	1.109	64	0.775
50	52.680	48	0.540	66	1.109	66	0.762
52	52.620	50	0.540	68	1.109	68	0.749
54	52.550	52	0.540	70	1.109	70	0.736
56	52.480	54	0.540	72	1.109	72	0.724
58	52.410	56	0.540	74	1.109	74	0.712
60	52.340	58	0.540	76	1.109	76	0.700
62	52.270	60	0.540	78	1.109	78	0.689
64	52.200	62	0.540	80	1.109	80	0.677
66	52.130	64	0.540	82	1.109	82	0.666
68	52.060	66	0.540	84	1.109	84	0.656
70	51.990	68	0.540				
72	51.920	70	0.540				
74	51.850	72	0.540				
76	51.780	74	0.540				
78	51.710	76	0.540				
80	51.640	78	0.540				
82	51.580	80	0.540				
84	51.510	82	0.540				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.430	60	0.014	60	0.00025		N
		70	0.021	70	0.00038		O
		80	0.032	80	0.00056		T
		90	0.047	90	0.00081		
		100	0.068	100	0.00116		P
		110	0.098	110	0.00164		E
		120	0.140	120	0.00230		R
		130	0.197	130	0.00317		T
		140	0.273	140	0.00434		I
		150	0.376	150	0.00587		N
		160	0.511	160	0.00786		E
		170	0.689	170	0.01042		N
		180	0.920	180	0.01370		T
		190	1.218	190	0.01785		
		200	1.598	200	0.02306		
		210	2.080	210	0.02957		
		220	2.687	220	0.03763		
		230	3.445	230	0.04754		
		240	4.385	240	0.05965		
		250	5.544	250	0.07435		
		260	6.963	260	0.09209		
		270	8.692	270	0.11340		
		280	10.780	280	0.13880		
		290	13.300	290	0.16890		
		300	16.320	300	0.20450		

# ETHYL CHLOROACETATE

ECA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chloroacetic acid, ethyl ester Ethyl chloracetate Ethyl chloroethanoate Monochloroethanoic acid, ethyl ester	Liquid  Colorless to light brown  Irritating or fruity odor  Sinks in water. Irritating vapor is produced.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, or nausea. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{ClCH}_2\text{COOC}_2\text{H}_5$
- 2.3 IMO/UN Designation: 3.3/1181
- 2.4 DOT ID No.: 1181
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 155
- 2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister mask; rubber gloves; chemical goggles.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membrane, headache, and nausea. Contact with liquid causes extreme eye irritation and conjunctivitis; irritates skin if not removed at once. Ingestion causes irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove patient to fresh air; get medical attention. EYES: flush with copious quantities of water for at least 15 min.; get medical attention if irritation persists. SKIN: wash with soap and water. INGESTION: give large amount of water and induce vomiting; get medical attention.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4;  $\text{LD}_{50}$  <50 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 129°F O.C. 100°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water fog, foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Irritating, toxic hydrogen chloride and phosgene may be generated in fires.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 2.3 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Very slow, not hazardous.
- 5.2 **Reactivity with Common Materials:** Slow hydrolysis to acidic products will cause slow corrosion of common metals. No hazard involved.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+1%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	-
Flammability (Red).....	3
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 122.6
- 9.3 **Boiling Point at 1 atm:** 289°F = 143°C = 416°K
- 9.4 **Freezing Point:** -15°F = -26°C = 247°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.15 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 24 dynes/cm = 0.024 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** 4.3
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** 155 Btu/lb = 86 cal/g =  $3.6 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** -7,250 Btu/lb = -4,028 cal/g =  $-168 \times 10^3$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYL CHLOROACETATE

ECA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	77.089	35	0.392	52	1.048	51	4.064
36	76.780	40	0.394	54	1.048	52	4.005
38	76.469	45	0.397	56	1.048	53	3.948
40	76.160	50	0.400	58	1.048	54	3.892
42	75.839	55	0.403	60	1.048	55	3.836
44	75.530	60	0.406	62	1.048	56	3.782
46	75.219	65	0.408	64	1.048	57	3.729
48	74.910	70	0.411	66	1.048	58	3.677
50	74.599	75	0.414	68	1.048	59	3.625
52	74.280	80	0.417	70	1.048	60	3.575
54	73.969	85	0.419	72	1.048	61	3.525
56	73.660	90	0.422	74	1.048	62	3.476
58	73.349	95	0.425	76	1.048	63	3.428
60	73.030	100	0.428	78	1.048	64	3.381
62	72.719			80	1.048	65	3.335
64	72.410			82	1.048	66	3.290
66	72.099			84	1.048	67	3.245
68	71.790			86	1.048	68	3.201
70	71.469					69	3.158
72	71.160					70	3.116
74	70.849					71	3.074
76	70.540					72	3.033
78	70.230					73	2.993
80	69.910					74	2.954
82	69.599					75	2.915
84	69.290					76	2.877

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	100	0.196	100	0.00401		N
	N	110	0.265	110	0.00531		O
	S	120	0.354	120	0.00697		T
	O	130	0.468	130	0.00906		
	L	140	0.613	140	0.01167		P
	U	150	0.795	150	0.01490		E
	B	160	1.024	160	0.01887		R
	L	170	1.308	170	0.02372		T
	E	180	1.657	180	0.02959		I
		190	2.085	190	0.03665		N
		200	2.605	200	0.04510		E
		210	3.233	210	0.05514		N
		220	3.987	220	0.06699		T
		230	4.887	230	0.08092		
		240	5.955	240	0.09720		
		250	7.216	250	0.11610		
		260	8.698	260	0.13800		
		270	10.430	270	0.16330		
		280	12.450	280	0.19220		
		290	14.780	290	0.22520		
		300	17.480	300	0.26280		

# N-ETHYLCYCLOHEXYLAMINE

ECC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Accelerator HX Cyclohexylamine, n-ethyl N-Cyclohexylethylamine N-Ethylcyclohexanamine Vulkacit HX	Liquid  Colorless  Musky ammonia odor  Floats and mixes slowly with water.
Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Notify local health and pollution agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE. Flashback along vapor trail may occur. Containers may explode in fire. Vapor may explode if ignited in enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with carbon dioxide, dry chemical, water spray, or alcohol foam. Cool exposed containers with water. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. If in eyes, hold eyelids open and flush with plenty of water. If swallowed, and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amines  
2.2 Formula:  $C_8H_{17}N$   
2.3 IMO/UN Designation: 3.3/1993  
2.4 DOT ID No.: 1993  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51453

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Gas mask suitable for ammonia; face shield or splash proof goggles; rubber gloves. If entering spill area, wear self-contained breathing apparatus and full protective clothing, including boots.
- 3.2 **Symptoms Following Exposure:** Inhalation of high concentration of vapor will produce irritation of the respiratory tract and lungs. Inhalation of large quantities of vapor may be fatal.
- 3.3 **Treatment of Exposure:** INHALATION: Remove from exposure area. Prompt medical attention required. EYES: Flush eyes with water for at least 10 minutes. Follow with a neutralizing or buffer solution if available. SKIN: Remove contaminated clothing. A dilute acetic acid (i.e. vinegar) solution followed by a water rinse should be used to cleanse affected skin areas.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 590 \text{ mg/Kg (rat)}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 86°F 0.C.; 115°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, water spray or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Dangerous when exposed to heat or flame. Can react vigorously with oxidizing materials.  
4.7 **Auto Ignition Temperature:** 545°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 63.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 17.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Not reactive  
5.2 **Reactivity with Common Materials:** Not reactive  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Will not occur  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%; 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Not listed  
7.4 **Venting:** Not listed  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 127.23  
9.3 **Boiling Point at 1 atm:** 329°F = 165°C = 438.2°K  
9.4 **Freezing Point:** -49°F = -45°C = 228.2°K  
9.5 **Critical Temperature:** 677.1°F = 358.4°C = 631.6°K  
9.6 **Critical Pressure:** 446.91 psia = 30.39 atm = 3.04 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.8527 at 25°C  
9.8 **Liquid Surface Tension:** 29.52 dynes/cm = 0.02952 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 43.5 dynes/cm = 0.0435 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 4.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N-ETHYLCYCLOHEXYLAMINE

ECC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	77	1.384

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.300	175 200 225 250 275 300	0.585 1.134 2.032 3.426 5.494 8.456	175 200 225 250 275 300	0.01076 0.02404 0.03731 0.05058 0.06385 0.07713		C U R R E N T L Y  N O T  A V A I L A B L E

# ETHYL CHLOROFORMATE

ECF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chloroformic acid, ethyl ester Ethyl chlorocarbonate	Liquid  Colorless to light yellow  Irritating odor  Reacts slowly with water. Irritating vapor is produced.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Evacuate area in case of large discharge. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with dry chemicals or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump  
Chemical and Physical Treatment:  
Neutralize  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CICOOCH}_3$   
2.3 IMO/UN Designation: 3.2/1182  
2.4 DOT ID No.: 1182  
2.5 CAS Registry No.: 541-41-3  
2.6 NAERG Guide No.: 155  
2.7 Standard Industrial Trade Classification: 51374

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-line mask, self-contained breathing apparatus, or organic and acid canister mask; full protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes mucous membrane irritation, coughing, and sneezing. Vapor causes severe lachrymation; liquid causes acid-type burns of eyes and skin, like those of hydrochloric acid. Ingestion causes severe burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; use artificial respiration if breathing has stopped; call a doctor; keep victim quiet and administer oxygen if needed. EYES: flush with water for at least 15 min.; see a doctor. SKIN: wash liberally with water for at least 15 min., then apply dilute solution of sodium bicarbonate or commercially prepared neutralizer. INGESTION: do NOT induce vomiting; give large amount of water; get medical attention.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; oral  $\text{LD}_{50}$  <50 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 82°F O.C. 61°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic chlorine and phosgene gases may be formed in fires.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 932°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 2.6 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 14.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Slow reaction with water, evolving hydrogen chloride (hydrochloric acid)  
5.2 **Reactivity with Common Materials:** Slow evolution of hydrogen chloride from surface moisture reaction can cause slow corrosion.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 94+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | -              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 1              |
- 8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 108.5  
9.3 **Boiling Point at 1 atm:** 201°F = 94°C = 367°K  
9.4 **Freezing Point:** -114°F = -81°C = 192°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.135 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 27.5 dynes/cm = 0.0275 N/m at 15°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.7  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1044  
9.12 **Latent Heat of Vaporization:** (est.) 140 Btu/lb = 79 cal/g =  $3.3 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** (est.) -6,900 Btu/lb = -3,800 cal/g =  $-160 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ETHYL CHLOROFORMATE

ECF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	72.790	42	0.406	42	1.048	42	4.641
40	72.500	44	0.407	44	1.048	44	4.504
45	72.209	46	0.408	46	1.048	46	4.372
50	71.910	48	0.409	48	1.048	48	4.245
55	71.620	50	0.410	50	1.048	50	4.123
60	71.320	52	0.411	52	1.048	52	4.005
65	71.030	54	0.412	54	1.048	54	3.892
70	70.730	56	0.413	56	1.048	56	3.782
75	70.440	58	0.414	58	1.048	58	3.677
80	70.139	60	0.416	60	1.048	60	3.575
85	69.849	62	0.417	62	1.048	62	3.476
90	69.549	64	0.418	64	1.048	64	3.381
95	69.259	66	0.419	66	1.048	66	3.290
100	68.959	68	0.420	68	1.048	68	3.201
		70	0.421	70	1.048	70	3.116
		72	0.422	72	1.048	72	3.033
		74	0.423	74	1.048	74	2.954
		76	0.424	76	1.048	76	2.877

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	60	0.055	60	0.00107	0	0.179
	E	70	0.090	70	0.00172	20	0.183
	A	80	0.145	80	0.00271	40	0.188
	C	90	0.229	90	0.00421	60	0.192
	T	100	0.356	100	0.00644	80	0.196
	S	110	0.546	110	0.00969	100	0.201
		120	0.825	120	0.01438	120	0.205
		130	1.228	130	0.02105	140	0.209
		140	1.804	140	0.03042	160	0.213
		150	2.618	150	0.04341	180	0.217
		160	3.753	160	0.06122	200	0.221
		170	5.319	170	0.08538	220	0.226
		180	7.457	180	0.11780	240	0.230
		190	10.350	190	0.16100	260	0.234
		200	14.210	200	0.21770	280	0.238
		210	19.340	210	0.29190	300	0.242
						320	0.246
						340	0.250
						360	0.253
						380	0.257
						400	0.261
						420	0.265
						440	0.269

# ETHYLENE CHLOROHYDRIN

ECH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Chlorethanol 2-Chloroethanol 2-Chloroethyl alcohol Ethylene chlorhydrin Glycol chlorohydrin	Liquid  Colorless  Faint sweet pleasant odor  Mixes with water. Irritating vapor is produced.
<b>Fire</b> Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with water, dry chemicals, alcohol foam, or carbon dioxide.	
<b>Exposure</b> Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
<b>Water Pollution</b> Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $\text{C}_2\text{H}_4\text{Cl}_2\text{OH}$   
2.3 IMO/UN Designation: 3.3/1135  
2.4 DOT ID No.: 1135  
2.5 CAS Registry No.: 107-07-3  
2.6 NAERG Guide No.: 131  
2.7 Standard Industrial Trade Classification: 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister mask or self-contained breathing apparatus; goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of upper respiratory system, nausea, headache, delirium, coma, collapse. Liquid causes irritation of eyes and skin; prolonged contact with skin may allow penetration into body and cause same symptoms as following ingestion or inhalation. Ingestion causes nausea, headache, delirium, coma, and collapse.  
3.3 **Treatment of Exposure:** INHALATION: remove from exposure; give artificial respiration if breathing has stopped; call physician. EYES: flush with water for at least 15 min.; get medical attention if irritation persists. SKIN: wash off with copious amounts of water; call physician if contact has been prolonged. INGESTION: give large amounts of water; get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 1 ppm  
3.7 **Toxicity by Ingestion:** Grade 3; oral  $\text{LD}_{50} = 71 \text{ mg/kg}$  (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Damage to central nervous system and liver in humans  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 7 ppm  
3.14 **OSHA PEL-TWA:** 5 ppm.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 139°F O.C.  
4.2 **Flammable Limits in Air:** 4.9%-15.9%  
4.3 **Fire Extinguishing Agents:** Water, alcohol foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene fumes may be formed.  
4.6 **Behavior in Fire:** Vapors are heavier than air and may flash back to a source of ignition.  
4.7 **Auto Ignition Temperature:** 797°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 1.7 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 11.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0.50 lb/lb, 10 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 80.51  
9.3 **Boiling Point at 1 atm:** 263.7°F = 128.7°C = 401.9°K  
9.4 **Freezing Point:** -80.7°F = -62.6°C = 210.6°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.197 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.8  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 221 Btu/lb = 123 cal/g =  $5.15 \times 10^5 \text{ J/kg}$   
9.13 **Heat of Combustion:** -6,487 Btu/lb = -3,604 cal/g =  $-150.8 \times 10^5 \text{ J/kg}$   
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYLENE CHLOROHYDRIN

ECH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	75.980	65	0.451	51	1.048	52	4.323
40	75.790	70	0.453	52	1.048	54	4.196
45	75.599	75	0.454	53	1.048	56	4.074
50	75.410	80	0.456	54	1.048	58	3.956
55	75.209	85	0.458	55	1.048	60	3.842
60	75.020	90	0.460	56	1.048	62	3.732
65	74.830	95	0.462	57	1.048	64	3.627
70	74.639	100	0.463	58	1.048	66	3.525
75	74.450	105	0.465	59	1.048	68	3.426
80	74.259	110	0.467	60	1.048	70	3.331
85	74.070	115	0.469	61	1.048	72	3.240
90	73.879	120	0.471	62	1.048	74	3.151
95	73.690	125	0.472	63	1.048	76	3.066
100	73.500	130	0.474	64	1.048	78	2.984
105	73.309			65	1.048	80	2.904
110	73.120			66	1.048	82	2.827
115	72.929			67	1.048	84	2.753
120	72.740			68	1.048	86	2.681
						88	2.611
						90	2.544
						92	2.479
						94	2.416

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	60	0.073	60	0.00105		N
	I	70	0.103	70	0.00147		O
	S	80	0.146	80	0.00203		T
	C	90	0.203	90	0.00277		
	I	100	0.279	100	0.00374		P
	B	110	0.379	110	0.00499		E
	L	120	0.510	120	0.00660		R
	E	130	0.679	130	0.00864		T
		140	0.896	140	0.01120		I
		150	1.171	150	0.01440		N
		160	1.517	160	0.01836		E
		170	1.950	170	0.02322		N
		180	2.486	180	0.02915		T
		190	3.146	190	0.03632		
		200	3.954	200	0.04495		
		210	4.935	210	0.05527		
		220	6.119	220	0.06752		
		230	7.540	230	0.08199		
		240	9.235	240	0.09900		
		250	11.250	250	0.11890		
		260	13.620	260	0.14200		

# ETHYL CHLORIDE

ECL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chloroethane Ether, hydrochloric Monochlorethane	Liquid                      Colorless                      Pleasant odor  Floats and may boil on water. Flammable, irritating vapor is produced. Boiling point is 54°F.
Evacuate. Keep people away. Avoid inhalation. Shut off ignition sources and call fire department. Avoid contact with liquid. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Stop flow of gas or liquid if possible. Cool exposed containers and men effecting shutoff with water. Let fire burn.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause dizziness or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Will cause frostbite. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Not harmful to aquatic life. May be dangerous if it enters water intakes. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 36; Halogenated hydrocarbon  
 2.2 **Formula:** C<sub>2</sub>H<sub>5</sub>Cl  
 2.3 **IMO/UN Designation:** 2.0/1037  
 2.4 **DOT ID No.:** 1037  
 2.5 **CAS Registry No.:** 75-00-3  
 2.6 **NAERG Guide No.:** 115  
 2.7 **Standard Industrial Trade Classification:** 51136

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Neoprene rubber clothing where liquid contact is likely; chemical worker's goggles. **RESPIRATORY PROTECTION:** for 1000 ppm to 2% for 1/2 hr or less, full face mask and organic vapor canister; for greater levels, self-contained breathing apparatus or equivalent.  
 3.2 **Symptoms Following Exposure:** Vapor causes drunkenness, anesthesia, possible lung injury. Liquid may cause frostbite on eyes and skin.  
 3.3 **Treatment of Exposure:** INHALATION: get person to fresh air, keep warm and quiet. Get medical attention. SKIN: treat frostbite.  
 3.4 **TLV-TWA:** 100 ppm  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Not pertinent  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** 3,800 ppm  
 3.14 **OSHA PEL-TWA:** 1,000 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -45°F O.C. -58°F C.C.  
 4.2 **Flammable Limits in Air:** 3.6%-12%  
 4.3 **Fire Extinguishing Agents:** Water fog, carbon dioxide, dry chemical. For large fires it is best to allow material to burn while cooling surrounding equipment. Stop flow of ethyl chloride.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are generated in fires.  
 4.6 **Behavior in Fire:** Containers may explode.  
 4.7 **Auto Ignition Temperature:** 966°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 3.8 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 14.3 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 13.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 98-100%; USP: 100%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Safety relief  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** 2  
 7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas  
 8.2 **49 CFR Class:** 2.1  
 8.3 **49 CFR Package Group:** Not pertinent.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** 100 pounds  
 8.7 **EPA Pollution Category:** B  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
 9.2 **Molecular Weight:** 64.52  
 9.3 **Boiling Point at 1 atm:** 54.0°F = 12.2°C = 285.4°K  
 9.4 **Freezing Point:** -213°F = -136°C = 137°K  
 9.5 **Critical Temperature:** 369.0°F = 187.2°C = 460.4°K  
 9.6 **Critical Pressure:** 758 psia = 51.6 atm = 5.23 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.906 at 12.2°C (liquid)  
 9.8 **Liquid Surface Tension:** 19.5 dynes/cm = 0.0195 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 0°C  
 9.10 **Vapor (Gas) Specific Gravity:** 2.2  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.155  
 9.12 **Latent Heat of Vaporization:** 163 Btu/lb = 90.6 cal/g = 3.79 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -8100 Btu/lb = -4500 cal/g = -188.4 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** 16.49 cal/g  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 34.5 psia

### NOTES

# ETHYL CHLORIDE

ECL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
C U R R E N T L Y  N O T  A V A I L A B L E		-20	0.299	28	0.880	15	0.364
		-15	0.305	30	0.878	20	0.354
		-10	0.312	32	0.876	25	0.345
		-5	0.319	34	0.875	30	0.336
		0	0.325	36	0.873	35	0.328
		5	0.332	38	0.871	40	0.320
		10	0.339	40	0.869	45	0.312
		15	0.345	42	0.868	50	0.305
		20	0.352	44	0.866		
		25	0.359	46	0.864		
		30	0.365	48	0.863		
		35	0.372	50	0.861		
		40	0.379	52	0.859		
		45	0.385	54	0.858		
		50	0.392				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.600	-35	1.419	-35	0.02008	0	0.207
		-30	1.659	-30	0.02320	25	0.215
		-25	1.932	-25	0.02671	50	0.223
		-20	2.242	-20	0.03065	75	0.231
		-15	2.594	-15	0.03506	100	0.239
		-10	2.991	-10	0.03997	125	0.247
		-5	3.438	-5	0.04544	150	0.254
		0	3.939	0	0.05151	175	0.262
		5	4.501	5	0.05822	200	0.269
		10	5.129	10	0.06563	225	0.277
		15	5.828	15	0.07379	250	0.284
		20	6.604	20	0.08275	275	0.291
		25	7.465	25	0.09257	300	0.298
		30	8.416	30	0.10330	325	0.305
		35	9.466	35	0.11500	350	0.311
		40	10.620	40	0.12780	375	0.318
		45	11.890	45	0.14160	400	0.324
		50	13.280	50	0.15670	425	0.331
		55	14.810	55	0.17290	450	0.337
		60	16.470	60	0.19050	475	0.343
		65	18.290	65	0.20950	500	0.349
		70	20.260	70	0.22990	525	0.355
		75	22.400	75	0.25180	550	0.360
		80	24.730	80	0.27540	575	0.366
		85	27.240	85	0.30060	600	0.372

# ETHYLDICHLOROSILANE

ECS

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless	Sharp, irritating odor
	Reacts violently with water. Irritating gas is produced on contact with water.		
Evacuate. Keep people away. Avoid contact with liquid. Avoid inhalation. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
Fire	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear chemical protective suit with self-contained breathing apparatus. DO NOT USE WATER OR FOAM ON FIRE.		
Exposure	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_2H_5SiHCl_2$   
2.3 IMO/UN Designation: 3.2/1183  
2.4 DOT ID No.: 1183  
2.5 CAS Registry No.: 1789-58-8  
2.6 NAERG Guide No.: 139  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Acid-vapor-type respiratory protection; rubber gloves; chemical worker's goggles; other equipment as necessary to protect skin and eyes.
- 3.2 **Symptoms Following Exposure:** Inhalation irritates mucous membranes. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove to fresh air, give artificial respiration if required. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; give large amounts of water, followed by milk or milk of magnesia.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $LD_{50} = 50$  to 500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 30°F O.C.
- 4.2 **Flammable Limits in Air:** 2.9% (LFL)
- 4.3 **Fire Extinguishing Agents:** Dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam
- 4.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene gases may be formed.
- 4.6 **Behavior in Fire:** Difficult to extinguish; re-ignition may occur. Contact with water applied to adjacent fires produces irritating hydrogen chloride fumes and flammable hydrogen gas.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 3.2 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 19.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously, evolving hydrogen chloride (hydrochloric acid)
- 5.2 **Reactivity with Common Materials:** Reaction with surface moisture will generate hydrogen chloride, which corrodes common metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Dangerous When Wet
- 8.2 49 CFR Class: 4.3
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 129.1
- 9.3 **Boiling Point at 1 atm:** 165°F = 74°C = 347°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.092 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 21.7 dynes/cm = 0.0217 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 4.5
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** (est.) 104 Btu/lb = 57.8 cal/g =  $2.42 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** (est.) -6,500 Btu/lb = -3,600 cal/g =  $-150 \times 10^5$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYLDICHLOROSILANE

ECS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
28	69.719	52	0.451	52	0.839	50	0.848
30	69.639	54	0.452	54	0.839	51	0.824
32	69.570	56	0.453	56	0.839	52	0.802
34	69.490	58	0.454	58	0.839	53	0.780
36	69.410	60	0.456	60	0.839	54	0.759
38	69.339	62	0.457	62	0.839	55	0.739
40	69.259	64	0.458	64	0.839	56	0.719
42	69.190	66	0.459	66	0.839	57	0.700
44	69.110	68	0.460	68	0.839	58	0.681
46	69.030	70	0.461	70	0.839	59	0.663
48	68.959	72	0.462	72	0.839	60	0.646
50	68.879	74	0.463	74	0.839	61	0.629
52	68.809	76	0.464	76	0.839	62	0.612
54	68.730	78	0.466	78	0.839	63	0.596
56	68.660	80	0.467	80	0.839	64	0.581
58	68.590	82	0.468	82	0.839	65	0.566
60	68.509	84	0.469	84	0.839	66	0.551
62	68.429	86	0.470	86	0.839	67	0.537
64	68.360			88	0.839	68	0.523
66	68.280					69	0.510
68	68.209					70	0.497
70	68.129					71	0.485
72	68.059					72	0.472
74	67.980					73	0.461
76	67.910					74	0.449
78	67.830					75	0.438

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	55	1.402	55	0.03275		N
	E	60	1.593	60	0.03686		O
	A	65	1.806	65	0.04139		T
	C	70	2.042	70	0.04636		
	T	75	2.304	75	0.05182		P
	S	80	2.594	80	0.05780		E
		85	2.914	85	0.06433		R
		90	3.266	90	0.07146		T
		95	3.654	95	0.07922		I
		100	4.079	100	0.08765		N
		105	4.545	105	0.09680		E
		110	5.054	110	0.10670		N
		115	5.611	115	0.11740		T
		120	6.217	120	0.12900		
		125	6.877	125	0.14150		
		130	7.594	130	0.15490		
		135	8.371	135	0.16930		
		140	9.213	140	0.18480		
		145	10.120	145	0.20140		
		150	11.110	150	0.21910		
		155	12.170	155	0.23810		
		160	13.310	160	0.25830		
		165	14.540	165	0.27990		
		170	15.860	170	0.30290		
		175	17.280	175	0.32740		

# ETHYL CHLOROTHIOFORMATE

ECT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethyl chlorothioformate		Liquid	Colorless
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Flammable. Vapors can flow to distant ignition source and flash back. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 0; Unassigned cargoes  
2.2 **Formula:** CH<sub>3</sub>CH<sub>2</sub>SC(O)Cl  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** 2826  
2.5 **CAS Registry No.:** 2941-64-2  
2.6 **NAERG Guide No.:** 155  
2.7 **Standard Industrial Trade Classification:** 51374

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 86°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as sulfur oxides, hydrogen chloride, and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Vapors can flow along surfaces to distant ignition source and flash back.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: (4)  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive Material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 124.59  
9.3 **Boiling Point at 1 atm:** 269.6°F = 132°C = 405°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.195  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ETHYL CHLOROTHIOFORMATE

ECT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	73 158	0.251 1.741	73 158	0.00548 0.03270		C U R R E N T L Y  N O T  A V A I L A B L E

# ETHYL CYCLOHEXANE

ECY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cyclohexyl ethane	Liquid                      Colorless
<p>Keep people away. Avoid inhalation. Shut off all ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.</p>	
<b>Fire</b>	<b>COMBUSTIBLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective on fire. Extinguish with foam, carbon dioxide, or dry chemicals. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose, and throat. If inhaled, will cause dizziness, nausea, vomiting, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** (C<sub>8</sub>H<sub>16</sub>)C<sub>2</sub>H<sub>6</sub>  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 1678-91-7  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Hydrocarbon vapor canister, supplied-air or hose mask, hydrocarbon-insoluble rubber or plastic gloves, chemical goggles or face splash shield, hydrocarbon-insoluble rubber or plastic apron.
- 3.2 **Symptoms Following Exposure:** Dizziness, with nausea and vomiting. Concentrated vapor may cause collapse and unconsciousness.
- 3.3 **Treatment of Exposure:** INHALATION: Remove victim to fresh air; if breathing stops, apply artificial respiration and administer oxygen. SKIN OR EYE CONTACT: Remove contaminated clothing and gently flush affected areas with water for at least 15 minutes; call a physician.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 95°F C.C.  
4.2 **Flammable Limits in Air:** 0.9-6.6%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective against fire  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 460°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** (C)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not Listed  
8.2 **49 CFR Class:** Not Pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- |                           |                |
|---------------------------|----------------|
| Category                  | Classification |
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 112.22  
9.3 **Boiling Point at 1 atm:** 269°F = 132°C = 405°K  
9.4 **Freezing Point:** -168°F = -111.3°C = 162°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.7880 @ 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.87 (est)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 180 Btu/lb = 99.9 cal/g = 4.2 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -20,024 Btu/lb = -11,124 cal/g = 466 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** (est) -91,314 Btu/lb = -50,730 cal/g = -212 X 10<sup>5</sup> J/kg  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** 17.75 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.6 psia

### NOTES

# ETHYL CYCLOHEXANE

ECY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	49.190	80	0.450		C		C
		90	0.451		U		U
		100	0.451		R		R
		110	0.452		R		R
		120	0.452		E		E
		130	0.453		N		N
		140	0.453		T		T
		150	0.454		L		L
		160	0.455		Y		Y
		170	0.455				
		180	0.456		N		N
		190	0.456		O		O
		200	0.457		T		T
		210	0.457				
		220	0.458		A		A
		230	0.458		V		V
		240	0.459		A		A
		250	0.459		I		I
		260	0.460		L		L
					A		A
					B		B
					L		L
					B		B
					L		L
					E		E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C	20	0.047		C	0	0.025
	U	40	0.077		U	25	0.031
	R	60	0.126		R	50	0.036
	R	80	0.207		R	75	0.042
	E	100	0.338		E	100	0.047
	N	120	0.553		N	125	0.053
	T	140	0.904		T	150	0.058
	L	160	1.479		L	175	0.064
	Y	180	2.419		Y	200	0.069
		200	3.956			225	0.074
		220	6.471		N	250	0.080
	N	240	10.583		O	275	0.085
	O				T	300	0.091
						325	0.096
	A				A	350	0.102
	V				V	375	0.107
	A				A	400	0.113
	I				I	425	0.118
	L				L	450	0.124
	A				A	475	0.129
	B				B	500	0.135
	L				L	525	0.140
	E				E	550	0.146
						575	0.151
						600	0.157

# ETHYLENEDIAMINE

EDA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Diaminoethane 1,2-Ethanediamine Ethylenediamine (Dow) Ethyleneamine 1302)	Liquid                      Colorless                      Mild ammonia odor  Floats and mixes with water. Irritating vapor is produced. Freezing point is 52°F.
Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amine
- 2.2 Formula:  $\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$
- 2.3 IMO/UN Designation: 8.0/1604
- 2.4 DOT ID No.: 1604
- 2.5 CAS Registry No.: 107-15-3
- 2.6 NAERG Guide No.: 132
- 2.7 Standard Industrial Trade Classification: 51452

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full rubber protective clothing, incl. gloves and boots; chemical worker's goggles; face shield where contact with face is likely. If necessary to enter closed area for 1/2 hr or less with mist, wear full-faced gas mask with canister approved by Bureau of Standards for use with ammonia.
- 3.2 **Symptoms Following Exposure:** High concentration of vapor burns eyes and irritates nose and throat. Liquid burns eyes and skin.
- 3.3 **Treatment of Exposure:** Get medical help immediately] INGESTION: drink large amounts of water or milk quickly, induce vomiting only if instructed by physician. EYES: flush immediately and thoroughly with flowing water for at least 15 min. SKIN: remove clothing and flush affected area with copious amounts of flowing water, then wash with soap and water; severe exposure may require showering.
- 3.4 **TLV-TWA:** 10 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50}$  = 0.5 to 5 g/kg (female rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second- degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** 10 ppm
- 3.13 **IDLH Value:** 1,000 ppm
- 3.14 **OSHA PEL-TWA:** 10 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 99°F O.C. 150°F C.C.
- 4.2 **Flammable Limits in Air:** 5.8%–11.1%
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemicals, foam or water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water in case of drum or tank fires.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 715°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 2.2 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Gives off heat, but reaction is not hazardous.
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 60 ppm/24 hr/chub/killed/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 75% (theor.), 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 60.10
- 9.3 **Boiling Point at 1 atm:** 243°F = 117°C = 390°K
- 9.4 **Freezing Point:** 51.8°F = 11.0°C = 284.2°K
- 9.5 **Critical Temperature:** 608.0°F = 320°C = 593.2°K
- 9.6 **Critical Pressure:** 941 psia = 64 atm = 6.4 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.909 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.087
- 9.12 **Latent Heat of Vaporization:** 288 Btu/lb = 160 cal/g = 6.70 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** –12,290 Btu/lb = –6830 cal/g = –286.0 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) –9 Btu/lb = –5 cal/g = –0.2 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.6 psia

### NOTES

# ETHYLENEDIAMINE

EDA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	57.000	60	0.689		N		N
70	56.650	70	0.694		O		O
80	56.290	80	0.698		T		T
90	55.940	90	0.703				
100	55.590	100	0.707		P		P
110	55.230	110	0.712		E		E
120	54.880	120	0.716		R		R
130	54.520	130	0.720		T		T
140	54.170	140	0.725		I		I
150	53.820	150	0.729		N		N
160	53.460	160	0.734		E		E
170	53.110	170	0.738		N		N
180	52.760	180	0.743		T		T
190	52.400	190	0.747				
200	52.050	200	0.752				
210	51.690	210	0.756				
		220	0.760				
		230	0.765				
		240	0.769				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	60	0.151	60	0.00162	0	0.381
	I	70	0.216	70	0.00228	25	0.392
	S	80	0.304	80	0.00315	50	0.404
	C	90	0.420	90	0.00428	75	0.415
	I	100	0.573	100	0.00573	100	0.426
	B	110	0.771	110	0.00757	125	0.437
	L	120	1.023	120	0.00988	150	0.448
	E	130	1.340	130	0.01273	175	0.459
		140	1.737	140	0.01621	200	0.470
		150	2.226	150	0.02044	225	0.480
		160	2.824	160	0.02552	250	0.491
		170	3.550	170	0.03156	275	0.501
		180	4.422	180	0.03870	300	0.511
		190	5.461	190	0.04706	325	0.521
		200	6.692	200	0.05679	350	0.531
		210	8.138	210	0.06804	375	0.540
		220	9.827	220	0.08095	400	0.550
		230	11.790	230	0.09568	425	0.559
		240	14.050	240	0.11240	450	0.569
		250	16.640	250	0.13130	475	0.578
		260	19.600	260	0.15250	500	0.587
		270	22.950	270	0.17610	525	0.595
		280	26.750	280	0.20250	550	0.604
		290	31.020	290	0.23160	575	0.613
		300	35.800	300	0.26380	600	0.621

# ETHYLENE DIBROMIDE

EDB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bromofume 1,2-Dibromoethane sym-Dibromoethane Dow-fume 40 Ethylene bromide Glycol dibromide W-10 W-15 W-40	Liquid  Colorless  Sweet odor  Sinks in water. Poisonous vapor is produced. Freezing point is 50°F.
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 36; Halogenated hydrocarbon  
2.2 **Formula:** BrCH<sub>2</sub>CH<sub>2</sub>Br  
2.3 **IMO/UN Designation:** 6.1/1605  
2.4 **DOT ID No.:** 1605  
2.5 **CAS Registry No.:** 106-93-4  
2.6 **NAERG Guide No.:** 154  
2.7 **Standard Industrial Trade Classification:** 51138

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Canister type mask or self-contained air mask; neoprene gloves; chemical safety goggles.  
3.2 **Symptoms Following Exposure:** Local inflammation, blisters and ulcers on skin; irritation in lungs and organic injury to liver and kidneys; may be absorbed through skin.  
3.3 **Treatment of Exposure:** Remove from exposure. Remove contaminated clothing. Wash skin with soap and water. Flush eyes with plenty of water. Consult physician.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 100 ppm  
3.14 **OSHA PEL-TWA:** 20 ppm  
3.15 **OSHA PEL-STEL:** 50 ppm peak for 5 minutes per 8 hour shift  
3.16 **OSHA PEL-Ceiling:** 30 ppm  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion**  
**Products:** Decomposition gases are toxic and irritating.  
4.6 **Behavior in Fire:** Decomposes into toxic irritating gases. Reacts with hot metals such as aluminum and magnesium.  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
18 mg/l/48 hr/bluegill/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1 pound  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** U067  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 187.86  
9.3 **Boiling Point at 1 atm:** 268°F = 131°C = 404°K  
9.4 **Freezing Point:** 49.6°F = 9.8°C = 283.0°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 2.180 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 38.75 dynes/cm = 0.03875 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 36.54 dynes/cm = 0.03654 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.109  
9.12 **Latent Heat of Vaporization:** 82.1 Btu/lb = 45.6 cal/g = 1.91 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 13.79 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.4 psia

### NOTES

# ETHYLENE DIBROMIDE

EDB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
55	135.900	60	0.173	50	0.776	60	1.818
60	135.900	70	0.173	55	0.771	70	1.676
65	135.900	80	0.174	60	0.767	80	1.549
70	135.799	90	0.174	65	0.763	90	1.436
75	135.799	100	0.175	70	0.758	100	1.335
80	135.699	110	0.175	75	0.754	110	1.244
85	135.699	120	0.176	80	0.750	120	1.162
90	135.699	130	0.176	85	0.745	130	1.088
95	135.599	140	0.177	90	0.741	140	1.021
100	135.599	150	0.178	95	0.737	150	0.960
105	135.599	160	0.178	100	0.732	160	0.905
110	135.500	170	0.179	105	0.728	170	0.854
115	135.500	180	0.179	110	0.724	180	0.808
120	135.500	190	0.180	115	0.719	190	0.765
		200	0.180	120	0.715	200	0.726
		210	0.181	125	0.711	210	0.690
				130	0.706		
				135	0.702		
				140	0.698		
				145	0.693		
				150	0.689		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.270	60	0.155	60	0.00521	0	0.100
		70	0.209	70	0.00690	25	0.103
		80	0.279	80	0.00904	50	0.105
		90	0.368	90	0.01172	75	0.108
		100	0.481	100	0.01504	100	0.111
		110	0.623	110	0.01914	125	0.113
		120	0.799	120	0.02414	150	0.116
		130	1.018	130	0.03020	175	0.118
		140	1.285	140	0.03749	200	0.121
		150	1.609	150	0.04620	225	0.123
		160	2.002	160	0.05653	250	0.126
		170	2.473	170	0.06872	275	0.128
		180	3.034	180	0.08301	300	0.130
		190	3.700	190	0.09966	325	0.132
		200	4.484	200	0.11900	350	0.135
		210	5.404	210	0.14120	375	0.137
		220	6.476	220	0.16680	400	0.139
		230	7.722	230	0.19590	425	0.141
		240	9.160	240	0.22910	450	0.143
		250	10.810	250	0.26670	475	0.145
		260	12.710	260	0.30900	500	0.147
		270	14.870	270	0.35660	525	0.149
		280	17.320	280	0.40980	550	0.150
		290	20.100	290	0.46910	575	0.152
		300	23.220	300	0.53500	600	0.154

# ETHYLENE DICHLORIDE

EDC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Brocide 1,2-Dichloroethane Dutch liquid EDC Ethylene chloride Glycol dichloride	Liquid  Colorless  Sweet odor  Sinks in water. Flammable, irritating vapor is produced.
<b>Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 36; Halogenated hydrocarbon  
2.2 **Formula:** C<sub>2</sub>H<sub>2</sub>Cl<sub>2</sub>  
2.3 **IMO/UN Designation:** 3.2/1184  
2.4 **DOT ID No.:** 1184  
2.5 **CAS Registry No.:** 107-06-2  
2.6 **NAERG Guide No.:** 129  
2.7 **Standard Industrial Trade Classification:** 51135

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Clean, body-covering clothing and safety glasses with side shields.  
Respiratory protection: up to 50 ppm, none; 50 ppm to 2%, 1/2 hr or less, full face mask and canister; greater than 2%, self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** Inhalation of vapors causes nausea, drunkenness, depression.  
Contact of liquid with eyes may produce corneal injury. Prolonged contact with skin may cause a burn.
- 3.3 **Treatment of Exposure:** INHALATION: if victim is overcome, remove him to fresh air, keep him quiet and warm, and get medical attention immediately; if breathing stops, give artificial respiration.  
INGESTION: induce vomiting; call a physician; treat the symptoms. EYES: flush immediately with copious amounts of flowing water for at least 15 min. SKIN: remove clothing and wash skin thoroughly with soap and water; wash contaminated clothing before reuse.
- 3.4 **TLV-TWA:** 10 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** 100 ppm  
3.13 **IDLH Value:** 50 ppm  
3.14 **OSHA PEL-TWA:** 50 ppm  
3.15 **OSHA PEL-STEL:** 200 ppm 5 minute peak in any 3 hours  
3.16 **OSHA PEL-Ceiling:** 100 ppm  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 60°F O.C. 55°F C.C.  
4.2 **Flammable Limits in Air:** 6.2%-15.6%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Toxic and irritating gases (hydrogen chloride, phosgene) are generated.  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 775°F  
4.8 **Electrical Hazards:** Class I, group D  
4.9 **Burning Rate:** 1.6 mm/min  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 11.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 11.5-13.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
150 ppm\*/pin perch/TL<sub>50</sub>/salt water  
\*Time period not specified.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
0.002 lb/lb, 5 days  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U077  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 98.96  
9.3 **Boiling Point at 1 atm:** 182.3°F = 83.5°C = 356.7°K  
9.4 **Freezing Point:** -32.3°F = -35.7°C = 237.5°K  
9.5 **Critical Temperature:** 550.4°F = 288°C = 561.2°K  
9.6 **Critical Pressure:** 735 psia = 50 atm = 5.1 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.253 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 32.2 dynes/cm = 0.0322 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 25°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.118  
9.12 **Latent Heat of Vaporization:** 138 Btu/lb = 76.4 cal/g = 3.2 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) 3400 Btu/lb  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 21.12 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 2.7 psia

### NOTES



# ETHYLENE DICHLORIDE

EDC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	79.879	0	0.283	0	0.990	35	1.098
40	79.629	10	0.285	10	0.982	40	1.054
45	79.379	20	0.288	20	0.974	45	1.013
50	79.129	30	0.290	30	0.965	50	0.975
55	78.879	40	0.293	40	0.957	55	0.938
60	78.620	50	0.296	50	0.949	60	0.904
65	78.370	60	0.298	60	0.941	65	0.871
70	78.120	70	0.301	70	0.933	70	0.840
75	77.860	80	0.303	80	0.924	75	0.811
80	77.599	90	0.306	90	0.916	80	0.784
85	77.349	100	0.309	100	0.908	85	0.758
90	77.089	110	0.311	110	0.900	90	0.733
95	76.830	120	0.314	120	0.892	95	0.709
100	76.570	130	0.317	130	0.883	100	0.687
105	76.309	140	0.319	140	0.875	105	0.665
110	76.049	150	0.322	150	0.867	110	0.645
115	75.790	160	0.324	160	0.859	115	0.625
120	75.520	170	0.327	170	0.850	120	0.607
125	75.259					125	0.589
130	74.990					130	0.573
135	74.730					135	0.556
140	74.459					140	0.541
145	74.190					145	0.526
150	73.919					150	0.512
155	73.660					155	0.499
160	73.379					160	0.486

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.800	15	0.231	15	0.00449	0	0.177
		20	0.274	20	0.00526	25	0.182
		25	0.323	25	0.00614	50	0.187
		30	0.380	30	0.00715	75	0.191
		35	0.445	35	0.00830	100	0.195
		40	0.520	40	0.00960	125	0.200
		45	0.606	45	0.01108	150	0.204
		50	0.704	50	0.01274	175	0.208
		55	0.816	55	0.01461	200	0.212
		60	0.942	60	0.01671	225	0.217
		65	1.085	65	0.01907	250	0.221
		70	1.246	70	0.02169	275	0.225
		75	1.428	75	0.02462	300	0.229
		80	1.632	80	0.02788	325	0.232
		85	1.860	85	0.03149	350	0.236
		90	2.116	90	0.03548	375	0.240
		95	2.401	95	0.03990	400	0.244
		100	2.718	100	0.04477	425	0.247
						450	0.251
						475	0.254
						500	0.258
						525	0.261
						550	0.265
						575	0.268
						600	0.271

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hexadrin Mendrin		Solid or solution	Colorless to tan	Odorless
Sinks in water.				
<b>KEEP PEOPLE AWAY.</b> Avoid inhalation. <b>AVOID CONTACT WITH LIQUID, SOLID AND DUST.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Combustible solution or non-flammable solid. POISONOUS GASES ARE PRODUCED IN FIRE. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.			
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  LIQUID OR SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge  
Do not burn

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{12}H_{11}Cl_2O$   
2.3 IMO/UN Designation: 6.1/2761  
2.4 DOT ID No.: 2761  
2.5 CAS Registry No.: 72-20-8  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 59110

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respirator for spray, fog, or dust; rubber gloves and boots.
- 3.2 **Symptoms Following Exposure:** Inhalation causes moderate irritation of nose and throat; prolonged breathing may cause same toxic symptoms as for ingestion. Contact with liquid causes moderate irritation of eyes and skin. Prolonged contact with skin may cause same toxic symptoms as for ingestion. Ingestion causes frothing of the mouth, facial congestion, convulsions, violent muscular contractions, dizziness, weakness, nausea.
- 3.3 **Treatment of Exposure:** Get medical attention after all exposures to this compound. INHALATION: remove from exposure. EYES: flush with water for at least 15 min. SKIN: wash with plenty of soap and water, but do not scrub. INGESTION: remove from the gastrointestinal tract, either by inducing vomiting (unless hydrocarbon solvents are involved and the amount of insecticide is well below the toxic amount) or by gastric lavage with saline solution; saline cathartics may also be beneficial; fats and oils should be avoided; sedation with barbituates is indicated if signs of CNS irritation are present; patient should have absolute quiet, expert nursing care, and a minimum of external stimuli to reduce danger of convulsions; epinephrine is contraindicated in view of the danger of precipitating ventricular fibrillation; if material ingested was dissolved in a hydrocarbon solvent, observe patient for possible development of hydrocarbon pneumonitis.
- 3.4 TLV-TWA: 0.1 mg/m<sup>3</sup>  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 4; oral LD<sub>50</sub> = 3 mg/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None known  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: 2 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 0.1 mg/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Non flammable solid or combustible solution > 80°F O.C. (xylene)
- 4.2 **Flammable Limits in Air:** 1.1%-7% (xylene)
- 4.3 **Fire Extinguishing Agents:** (Solution)  
Dry chemical, foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective on solution fire.
- 4.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosphene may be generated when solution burns.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 4 mm/min. (xylene)
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 95-98%; Dry formulations, up to 75% endrin; liquid formulations, up to 25% in flammable xylene
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: Yes
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3 2            |
| Flammability (Red).....   | 1 0            |
| Instability (Yellow)..... | 0 0            |
- 8.6 EPA Reportable Quantity: 1 pound
- 8.7 EPA Pollution Category: X
- 8.8 RCRA Waste Number: P051/D012
- 8.9 EPA FWPCA List: Yes

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 380.92
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** 392°F = 200°C = 573°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.65 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.005 ppm/48 hr/carp/TL<sub>50</sub>/fresh water  
0.0025 ppm/48 hr/brown shrimp/TL<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** LD<sub>50</sub> = 5.64 mg/kg
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Probable
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 4  
Human Contact hazard: II  
Reduction of amenities: XXX

## NOTES

# ENDRIN

EDR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ETHYLENEDIAMINE TETRACETIC ACID

EDT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> EDTA Endrate (Ethylenedinitrilo) tetraacetic acid Ethylene bis (iminodiacetic acid) Tetrine acid Versene acid	Solid powder      White      Odorless
	Floats on water.
Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  <b>SOLID</b> Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Salvage waterfowl  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  
 $(\text{HOOCCH}_2)_2\text{NCH}_2\text{CH}_2\text{N}(\text{CH}_2\text{COOH})_2$   
2.3 IMO/IUN Designation: Not listed  
2.4 DOT ID No.: 9117  
2.5 CAS Registry No.: 60-00-4  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification:  
51372

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Currently not available  
3.2 Symptoms Following Exposure: Currently not available  
3.3 Treatment of Exposure: Currently not available  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 1; LD<sub>50</sub> = 5 to 15 g/kg (as sodium or calcium salt)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point:  
Not flammable  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): N<sub>2</sub> diluent: 10.6%; CO<sub>2</sub> diluent: 13.0%

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity:  
129 ppm/96 hr/catfish/tapwater  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 1%, 5 days  
6.4 Food Chain Concentration Potential:  
None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed.  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 5000 pounds  
8.7 EPA Pollution Category: D  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Powder  
9.2 Molecular Weight: 164  
9.3 Boiling Point at 1 atm: Not pertinent  
9.4 Freezing Point: Currently not available  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.86 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ETHYLENEDIAMINE TETRACETIC ACID

EDT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.500		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 2-ETHOXYETHYL ACETATE

EEA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cellosolve acetate Ethylene glycol monoethyl ether acetate Glycol monoethyl ether acetate Poly-solv EE acetate	Liquid  Colorless  Mild ester-like odor  Floats and mixes slowly with water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $\text{CH}_3\text{COOCH}_2\text{CH}_2\text{OC}_2\text{H}_5$   
2.3 IMO/UN Designation: 3.3/1172  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 111-15-9  
2.6 NAERG Guide No.: Not listed.  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles, apron, and approved respirator.  
3.2 **Symptoms Following Exposure:** Vapors irritate nose and eyes in high concentrations. Liquid irritates skin in prolonged or repeated contact.  
3.3 **Treatment of Exposure:** INHALATION: if victim is overcome, remove him to fresh air and call physician. EYES: flush with large amounts of water. SKIN: wash exposed areas.  
3.4 **TLV-TWA:** 5 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rabbit).  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Causes kidney damage in laboratory animals. Effects unknown in humans.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.056 ppm.  
3.13 **IDLH Value:** 500 ppm.  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 130°F C.C.  
4.2 **Flammable Limits in Air:** LEL: 1.2% @ 199.4°F; UEL: 12.7% @ 275°F  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Not pertinent.  
4.6 **Behavior in Fire:** Toxic gases, such as carbon monoxide, may be produced in fire.  
4.7 **Auto Ignition Temperature:** 720°F  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Incompatible with oxidizing materials.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 4000 ppm/24 hr/brine shrimp/TL<sub>m</sub>  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 36% of theoretical in 5 days, freshwater.  
6.4 **Food Chain Concentration Potential:** None.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Pressure vacuum valve.  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	-

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 132.16  
9.3 **Boiling Point at 1 atm:** 313°F = 156°C = 429°K  
9.4 **Freezing Point:** -79.1°F = -61.7°C = 211.5°K  
9.5 **Critical Temperature:** 633.2°F = 334°C = 607.2°K  
9.6 **Critical Pressure:** 440 psia = 30 atm = 3.0 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.974 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.7  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.054  
9.12 **Latent Heat of Vaporization:** 130 Btu/lb = 74 cal/g =  $3.1 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** (est.) -10,700 Btu/lb = -6,000 cal/g =  $-250 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.1 psia.

### NOTES

# 2-ETHOXYETHYL ACETATE

EEA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	8.130		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	23.000	68	0.023	68	0.00054		C U R R E N T L Y  N O T  A V A I L A B L E

# ETHYLENE GLYCOL DIETHYL ETHER

EEE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Diethoxyethane Diethyl "cellosolve"	Liquid  Colorless  Mild pleasant odor  Floats and mixes slowly with water. Irritating vapor is produced.
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** C<sub>4</sub>H<sub>10</sub>OCH<sub>2</sub>CH<sub>2</sub>OC<sub>2</sub>H<sub>5</sub>  
2.3 **IMO/UN Designation:** 3.3/1153  
2.4 **DOT ID No.:** 1153  
2.5 **CAS Registry No.:** 16484-86-9  
2.6 **NAERG Guide No.:** 127  
2.7 **Standard Industrial Trade Classification:** 51616

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Protective goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with liquid irritates eyes but has little or no effect on skin. Ingestion causes irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove from exposure. EYES: flush with water for at least 15 min. SKIN: wash with copious amounts of water. INGESTION: drink water and get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 4,390 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 90°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 406°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 4.1 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0.10 lb/lb, 10 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 118.2  
9.3 **Boiling Point at 1 atm:** 252°F = 122°C = 395°K  
9.4 **Freezing Point:** -101°F = -74°C = 199°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.8484 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 4.1  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0504  
9.12 **Latent Heat of Vaporization:** 192 Btu/lb = 107 cal/g = 4.48 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) 15,000 Btu/lb = -8,100 cal/g = -340 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ETHYLENE GLYCOL DIETHYL ETHER

EEE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	53.820	52	0.411	85	1.016	51	0.954
36	53.770	54	0.412	90	1.010	52	0.945
38	53.720	56	0.413	95	1.004	53	0.937
40	53.680	58	0.414	100	0.998	54	0.928
42	53.630	60	0.416	105	0.992	55	0.920
44	53.580	62	0.417	110	0.986	56	0.912
46	53.530	64	0.418	115	0.980	57	0.904
48	53.480	66	0.419	120	0.974	58	0.896
50	53.430	68	0.420	125	0.968	59	0.888
52	53.380	70	0.421	130	0.963	60	0.880
54	53.340	72	0.422	135	0.957	61	0.872
56	53.290	74	0.423	140	0.951	62	0.865
58	53.240	76	0.424	145	0.945	63	0.857
60	53.190	78	0.426	150	0.939	64	0.850
62	53.140	80	0.427	155	0.933	65	0.842
64	53.090	82	0.428	160	0.927	66	0.835
66	53.040	84	0.429	165	0.921	67	0.828
68	53.000	86	0.430	170	0.915	68	0.821
70	52.950			175	0.910	69	0.814
72	52.900			180	0.904	70	0.807
74	52.850			185	0.898	71	0.800
76	52.800					72	0.794
78	52.750					73	0.787
80	52.700					74	0.780
82	52.660					75	0.774
84	52.610					76	0.768

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.700	214	5.961	214	0.09744	0	0.319
		216	6.270	216	0.10220	20	0.328
		218	6.592	218	0.10710	40	0.338
		220	6.929	220	0.11230	60	0.347
		222	7.281	222	0.11760	80	0.356
		224	7.649	224	0.12320	100	0.365
		226	8.033	226	0.12900	120	0.374
		228	8.434	228	0.13510	140	0.383
		230	8.853	230	0.14130	160	0.391
		232	9.289	232	0.14790	180	0.400
		234	9.745	234	0.15470	200	0.409
		236	10.220	236	0.16180	220	0.417
		238	10.710	238	0.16910	240	0.425
		240	11.230	240	0.17670	260	0.433
		242	11.770	242	0.18470	280	0.442
		244	12.330	244	0.19290	300	0.450
		246	12.910	246	0.20150	320	0.458
		248	13.520	248	0.21040	340	0.465
		250	14.150	250	0.21960	360	0.473
		252	14.810	252	0.22920	380	0.481
		254	15.500	254	0.23910	400	0.488
		256	16.210	256	0.24940	420	0.496
						440	0.503

# 2-ETHOXYETHANOL

EEO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cellosolve Dowanol EE Ethylene glycol ethyl ether Ethylene glycol monoethyl ether Glycol monoethyl ether Poly-solv EE	Oily liquid  Colorless  Sweet ether-like odor  Floats and mixes with water.
<b>Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 20; Alcohols, glycols  
2.2 **Formula:** HOCH<sub>2</sub>CH<sub>2</sub>OCH<sub>2</sub>CH<sub>3</sub>  
2.3 **IMO/UN Designation:** 3.3/1171  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** 110-80-5  
2.6 **NAERG Guide No.:** Not listed.  
2.7 **Standard Industrial Trade Classification:** 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic gas mask; goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Some eye irritation. Inhalation of vapors causes irritation of nose.  
3.3 **Treatment of Exposure:** Flush eyes with water for 15 min. Flush skin with large volumes of water. Call a physician.  
3.4 **TLV-TWA:** 5 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 3.1 g/kg (rabbit)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Excessive exposure may cause liver and kidney damage. Animal studies have produced malformed offspring and morphological changes in the testes.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 500 ppm  
3.14 **OSHA PEL-TWA:** 200 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 120°F C.C.  
4.2 **Flammable Limits in Air:** LEL: 1.7%; UEL: 15.7%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, carbon dioxide or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Toxic gases, such as carbon monoxide, may be produced in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 455°F  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** 2.4 mm/min  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Incompatible with strong oxidizers and alkalies, strong acids, copper.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 1.58 lb/lb, 5 days; 54% (theor.), 5 days  
6.4 **Food Chain Concentration Potential:** None.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: I  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 90.12  
9.3 **Boiling Point at 1 atm:** 275.2°F = 135.1°C = 408.3°K  
9.4 **Freezing Point:** -93.0°F = -69.4°C = 203.3°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.931 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.0 (at boiling point)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.064  
9.12 **Latent Heat of Vaporization:** 191 Btu/lb = 106 cal/g = 4.44 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -13,000 Btu/lb = -7,400 cal/g = -310 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.1 psia.

### NOTES

# 2-ETHOXYETHANOL

EEO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	7.770		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	68	0.073	68	0.00117		C U R R E N T L Y  N O T  A V A I L A B L E

# ETHYL-3-ETHOXYPROPIONATE

EEP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethoxy propionic acid, ethyl ester Ethyl beta-ethoxypropionate Propionic acid, 3-ethoxyethyl ester	Liquid  Floats on water.	Water-white  Esteric odor
Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Keep people away. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective on fire. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, throat. If inhaled will cause headache or dizziness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea, vomiting, dizziness or headache. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, DO NOT INDUCE VOMITING.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula: C<sub>7</sub>H<sub>12</sub>O<sub>5</sub>  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 763-69-9  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber boots, rubber gloves, rubber apron, and self-contained breathing apparatus or a supplied air respirator.  
3.2 **Symptoms Following Exposure:** Liquid or mist may irritate the eyes and skin. May cause headache, nausea and vomiting, central nervous system depression with dizziness, drowsiness and unconsciousness.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. Give artificial respiration, if not breathing. Give oxygen if breathing difficult. INGESTION: Do not induce vomiting. If spontaneous vomiting occurs keep victim's head below his hips to prevent his breathing the vomit. EYES: Flush with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with plenty of soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Prolonged or repeated exposure may cause dermatitis or conjunctivitis.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 138°F C.C.  
4.2 **Flammable Limits in Air:** LEL 1.05%  
4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, carbon dioxide, or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** >99%  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 146.21  
9.3 **Boiling Point at 1 atm:** 338°F = 170°C = 443.2°K  
9.4 **Freezing Point:** -148°F = -100°C = 173.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.95  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 5.0  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYL-3-ETHOXYPROPIONATE

EEP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	68	0.013		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.276 0.287 0.297 0.307 0.317 0.327 0.337 0.347 0.357 0.366 0.375 0.384 0.393 0.402 0.411 0.420 0.428 0.436 0.444 0.452 0.460 0.468 0.476 0.483 0.491

# ETHYL ETHER

EET

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Anesthesia ether Anesthetic ether Diethyl ether Diethyl oxide Ether Ethoxyethane	Watery liquid      Colorless      Sweet odor  Floats on water. Flammable, irritating vapor is produced. Boiling point is 94°F.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 41; Ether  
 2.2 Formula: C<sub>2</sub>H<sub>5</sub>OC<sub>2</sub>H<sub>5</sub>  
 2.3 IMO/UN Designation: 3.1/1155  
 2.4 DOT ID No.: 1155  
 2.5 CAS Registry No.: 60-29-7  
 2.6 NAERG Guide No.: 127  
 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved organic vapor canister mask; chemical goggles; synthetic rubber or plastic gloves.  
 3.2 **Symptoms Following Exposure:** Vapor inhalation may cause headache, nausea, vomiting, and loss of consciousness. Contact with eyes will be irritating. Skin contact from clothing wet with the chemical may cause burns.  
 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if breathing has stopped, apply artificial respiration; if breathing is irregular, give oxygen; call a physician. EYES: flush immediately with water for 15 min.  
 3.4 **TLV-TWA:** 400 ppm  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** 500 ppm  
 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly.  
 3.12 **Odor Threshold:** 0.83 ppm  
 3.13 **IDLH Value:** 1,900 ppm  
 3.14 **OSHA PEL-TWA:** 400 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -40°F O.C.  
 : -49°F C.C.  
 4.2 **Flammable Limits in Air:** 1.85%-36.5%  
 4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide or foam  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Decomposes violently when heated.  
 4.7 **Auto Ignition Temperature:** 356°F  
 4.8 **Electrical Hazards:** Class I, group C  
 4.9 **Burning Rate:** 6.7 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 10.3-10.5%; CO<sub>2</sub> diluent: 13.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** 3%, 5 days  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent; absolute; purified; anesthesia; USP; concentrated  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** Inerted  
 7.4 **Venting:** Pressure-vacuum  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** 2  
 7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** I  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	1

 8.6 **EPA Reportable Quantity:** 100 pounds  
 8.7 **EPA Pollution Category:** B  
 8.8 **RCRA Waste Number:** U117  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 74.12  
 9.3 **Boiling Point at 1 atm:** 94.3°F = 34.6°C = 307.8°K  
 9.4 **Freezing Point:** -177.3°F = -116.3°C = 156.9°K  
 9.5 **Critical Temperature:** 380.3°F = 193.5°C = 466.7°K  
 9.6 **Critical Pressure:** 527 psia = 35.9 atm = 3.64 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.714 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 17.0 dynes/cm = 0.0170 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** Not pertinent  
 9.10 **Vapor (Gas) Specific Gravity:** 2.6  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.081  
 9.12 **Latent Heat of Vaporization:** 153 Btu/lb = 84.9 cal/g = 3.56 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -14,550 Btu/lb = -8082 cal/g = -338.4 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** 23.45 cal/g  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 16.0 psia

### NOTES

# ETHYL ETHER

EET

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-110	51.170	35	0.523	-80	1.141	-35	0.445
-100	50.820	40	0.528	-70	1.125	-30	0.428
-90	50.460	45	0.533	-60	1.109	-25	0.412
-80	50.100	50	0.538	-50	1.093	-20	0.397
-70	49.740	55	0.543	-40	1.077	-15	0.383
-60	49.370	60	0.548	-30	1.061	-10	0.370
-50	49.010	65	0.553	-20	1.044	-5	0.358
-40	48.640	70	0.558	-10	1.028	0	0.346
-30	48.270	75	0.563	0	1.012	5	0.335
-20	47.900	80	0.568	10	0.996	10	0.324
-10	47.530	85	0.573	20	0.980	15	0.314
0	47.150	90	0.578	30	0.964	20	0.305
10	46.780			40	0.948	25	0.296
20	46.400			50	0.931	30	0.287
30	46.020			60	0.915	35	0.279
40	45.640			70	0.899	40	0.271
50	45.250			80	0.883	45	0.264
60	44.870					50	0.257
70	44.480					55	0.250
80	44.090					60	0.243
90	43.700					65	0.237
						70	0.231
						75	0.226
						80	0.220
						85	0.215
						90	0.210

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	12.790	-70	0.112	-70	0.00199	0	0.327
36	12.480	-60	0.170	-60	0.00293	25	0.339
38	12.170	-50	0.252	-50	0.00424	50	0.350
40	11.860	-40	0.366	-40	0.00603	75	0.362
42	11.550	-30	0.524	-30	0.00842	100	0.373
44	11.240	-20	0.738	-20	0.01159	125	0.385
46	10.930	-10	1.023	-10	0.01570	150	0.396
48	10.610	0	1.398	0	0.02099	175	0.407
50	10.300	10	1.885	10	0.02771	200	0.419
52	9.992	20	2.510	20	0.03613	225	0.430
54	9.681	30	3.304	30	0.04659	250	0.441
56	9.370	40	4.302	40	0.05944	275	0.452
58	9.059	50	5.543	50	0.07509	300	0.463
60	8.748	60	7.072	60	0.09397	325	0.474
62	8.437	70	8.942	70	0.11660	350	0.484
64	8.126	80	11.210	80	0.14340	375	0.495
66	7.815	90	13.930	90	0.17500	400	0.506
68	7.503	100	17.190	100	0.21200	425	0.517
70	7.192	110	21.040	110	0.25510	450	0.527
72	6.881	120	25.590	120	0.30480	475	0.538
74	6.570	130	30.910	130	0.36190	500	0.548
76	6.259	140	37.100	140	0.42710	525	0.558
78	5.948					550	0.569
80	5.637					575	0.579
82	5.326					600	0.589
84	5.015						

# ETHYL FORMATE

EFM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethyl formic ester Ethyl methanoate Formic acid, ethyl ester Formic ether	Liquid  Colorless  Pleasant odor  Floats and mixes with water. Flammable, irritating vapor is produced.
<b>Evacuate.</b> <b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Shut off ignition sources. Call fire department.</b> <b>Stay upwind. Use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE: Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{HCOOC}_2\text{H}_5$
- 2.3 IMO/UN Designation: 3.1/1190
- 2.4 DOT ID No.: 1190
- 2.5 CAS Registry No.: 109-94-4
- 2.6 NAERG Guide No.: 129
- 2.7 Standard Industrial Trade Classification: 51374

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister gas mask; goggles or face shield; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Inhalation of vapor causes slight irritation of the eyes and rapidly increasing irritation of the nose. High concentrations cause deep narcosis within a few minutes followed by death within a few hours. Contact with liquid causes moderate irritation of eyes and mild irritation of skin. Ingestion causes irritation of mouth and stomach; may cause deep narcosis and death if not treated.
- 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; begin artificial respiration if breathing has stopped; call physician. EYES: wash with water for 15 min.; call physician if needed. SKIN: wash with water for 15 min.; call physician if irritation persists. INGESTION: do NOT induce vomiting; get medical attention at once.
- 3.4 **TLV-TWA:** 100 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50}$  = 1,850 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 1,500 ppm
- 3.14 **OSHA PEL-TWA:** 100 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 10°F O.C.  
-4°F C.C.
- 4.2 **Flammable Limits in Air:** 2.8%-16.0%
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel long distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 851°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 3.6 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 16.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):**  $\text{N}_2$  diluent: 10.4%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 30%, 10 days; 0.5 lb/lb, 10 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 74.1
- 9.3 **Boiling Point at 1 atm:** 129.6°F = 54.2°C = 327.4°K
- 9.4 **Freezing Point:** -110°F = -79°C = 194°K
- 9.5 **Critical Temperature:** 455.0°F = 235°C = 508.2°K
- 9.6 **Critical Pressure:** 686 psia = 46.6 atm = 4.73 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.922 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 28 dynes/cm = 0.028 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** 2.6
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1014
- 9.12 **Latent Heat of Vaporization:** 176 Btu/lb = 98 cal/g = 4.1 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -9,500 Btu/lb = -5,300 cal/g = -220 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -50 Btu/lb = -28 cal/g = 1.2 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ETHYL FORMATE

EFM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	60.850	0	0.439	30	1.163	0	0.633
5	60.610	10	0.442	35	1.157	10	0.586
10	60.370	20	0.445	40	1.151	20	0.544
15	60.130	30	0.447	45	1.144	30	0.506
20	59.880	40	0.450	50	1.138	40	0.473
25	59.640	50	0.453	55	1.132	50	0.443
30	59.400	60	0.456	60	1.126	60	0.415
35	59.160	70	0.459	65	1.119	70	0.391
40	58.910	80	0.461	70	1.113	80	0.369
45	58.670	90	0.464	75	1.107	90	0.348
50	58.430	100	0.467	80	1.101	100	0.330
55	58.180	110	0.470	85	1.094	110	0.313
60	57.940	120	0.472	90	1.088	120	0.297
65	57.700			95	1.082		
70	57.460			100	1.076		
75	57.210			105	1.069		
80	56.970			110	1.063		
85	56.730			115	1.057		
90	56.490			120	1.051		
95	56.240			125	1.044		
100	56.000						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
71	9.100	0	0.556	0	0.00835	0	0.270
		5	0.652	5	0.00969	25	0.278
		10	0.763	10	0.01121	50	0.286
		15	0.889	15	0.01293	75	0.293
		20	1.033	20	0.01486	100	0.301
		25	1.196	25	0.01704	125	0.308
		30	1.381	30	0.01947	150	0.316
		35	1.590	35	0.02219	175	0.324
		40	1.826	40	0.02523	200	0.331
		45	2.091	45	0.02860	225	0.339
		50	2.388	50	0.03234	250	0.347
		55	2.720	55	0.03648	275	0.354
		60	3.090	60	0.04104	300	0.362
		65	3.502	65	0.04608	325	0.369
		70	3.960	70	0.05161	350	0.377
		75	4.468	75	0.05768	375	0.385
		80	5.029	80	0.06432	400	0.392
		85	5.648	85	0.07158	425	0.400
		90	6.330	90	0.07950	450	0.408
		95	7.081	95	0.08812	475	0.415
		100	7.904	100	0.09749	500	0.423
		105	8.806	105	0.10760	525	0.430
		110	9.792	110	0.11870	550	0.438
		115	10.870	115	0.13050	575	0.446
		120	12.040	120	0.14340	600	0.453
		125	13.320	125	0.15720		

# ETHYLENE GLYCOL MONOETHYL ETHER ACETATE

EGA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cellosolve acetate 2-Ethoxyethyl acetate Glycol monoethyl ether acetate Poly-solv EE acetate	Liquid                      Colorless                      Pleasant odor  Floats and mixes slowly with water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
 2.2 Formula: CH<sub>3</sub>COOCH<sub>2</sub>CH<sub>2</sub>OC<sub>2</sub>H<sub>5</sub>  
 2.3 IMO/UN Designation: 3.3/1172  
 2.4 DOT ID No.: 1172  
 2.5 CAS Registry No.: 111-15-9  
 2.6 NAERG Guide No.: 129  
 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Chemical safety goggles  
 3.2 **Symptoms Following Exposure:** Vapors irritate nose and eyes in high concentrations. Liquid irritates skin in prolonged or repeated contact.  
 3.3 **Treatment of Exposure:** INHALATION: if victim is overcome, remove him to fresh air and call physician. EYES: flush with large amounts of water. SKIN: wash exposed areas.  
 3.4 **TLV-TWA:** 5 ppm  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rabbit)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Causes kidney damage in laboratory animals. Effects unknown in humans.  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** 0.056 ppm  
 3.13 **IDLH Value:** 500 ppm  
 3.14 **OSHA PEL-TWA:** 100 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 200°F O.C.  
 4.2 **Flammable Limits in Air:** 1.7%-6.7%  
 4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 715°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** CO<sub>2</sub> diluent: 11.0%

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** 4000 ppm/24 hr/brine shrimp/TL<sub>m</sub>  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** 36% of theoretical in 5 days, freshwater  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** C  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** III  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	-

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 132.16  
 9.3 **Boiling Point at 1 atm:** 313°F = 156°C = 429°K  
 9.4 **Freezing Point:** -79.1°F = -61.7°C = 211.5°K  
 9.5 **Critical Temperature:** 633.2°F = 334°C = 607.2°K  
 9.6 **Critical Pressure:** 440 psia = 30 atm = 3.0 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.974 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** Not pertinent  
 9.9 **Liquid Water Interfacial Tension:** Not pertinent  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.054  
 9.12 **Latent Heat of Vaporization:** 130 Btu/lb = 74 cal/g = 3.1 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** (est.) -10,700 Btu/lb = -6,000 cal/g = -250 X 10<sup>3</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 0.1 psia

### NOTES

# ETHYLENE GLYCOL MONOETHYL ETHER ACETATE

EGA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	61.820	15	0.464		N		N
50	61.450	20	0.467		O		O
60	61.080	25	0.470		T		T
70	60.710	30	0.473				
80	60.350	35	0.476		P		P
90	59.980	40	0.478		E		E
100	59.610	45	0.481		R		R
110	59.240	50	0.484		T		T
120	58.880	55	0.487		I		I
130	58.510	60	0.489		N		N
140	58.140	65	0.492		E		E
150	57.770	70	0.495		N		N
160	57.410	75	0.498		T		T
170	57.040	80	0.501				
180	56.670	85	0.503				
190	56.300	90	0.506				
200	55.940	95	0.509				
210	55.570	100	0.512				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	23.000	60	0.020	60	0.00048	0	0.267
		70	0.031	70	0.00072	25	0.277
		80	0.046	80	0.00105	50	0.287
		90	0.068	90	0.00152	75	0.297
		100	0.097	100	0.00214	100	0.307
		110	0.138	110	0.00298	125	0.316
		120	0.192	120	0.00408	150	0.326
		130	0.263	130	0.00550	175	0.335
		140	0.356	140	0.00732	200	0.344
		150	0.476	150	0.00962	225	0.353
		160	0.628	160	0.01249	250	0.362
		170	0.820	170	0.01603	275	0.371
		180	1.058	180	0.02037	300	0.379
		190	1.353	190	0.02563	325	0.388
		200	1.712	200	0.03196	350	0.396
		210	2.148	210	0.03949	375	0.405
		220	2.672	220	0.04841	400	0.413
		230	3.298	230	0.05888	425	0.421
		240	4.040	240	0.07109	450	0.429
		250	4.913	250	0.08523	475	0.436
		260	5.934	260	0.10150	500	0.444
		270	7.122	270	0.12020	525	0.451
		280	8.496	280	0.14140	550	0.459
		290	10.080	290	0.16550	575	0.466
		300	11.880	300	0.19260	600	0.473

# ETHYLENE GLYCOL DIBUTYL ETHER

EGB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Dibutoxyethane Dibutyl cellosolve Ethane, 1,2-dibutoxy Ether ethylene glycol dibutyl	Liquid Colorless
<b>Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Water may be ineffective on fire. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> .
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Try to contain and skim  
Then dilute and disperse  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 40; Glycol esters  
2.2 **Formula:** C<sub>4</sub>H<sub>9</sub>OC<sub>2</sub>H<sub>4</sub>OC<sub>4</sub>H<sub>9</sub>  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 112-48-1  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Moderately toxic by ingestion and skin contact. Irritates skin and eyes.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove from exposure. EYES: Flush with water for at least 15 minutes. SKIN: Wash with copious amounts of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 3.25 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 185°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** On decomposition, it emits acid smoke and irritating fumes.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 69.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 21.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Not pertinent.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 174.32  
9.3 **Boiling Point at 1 atm:** 399°F = 204°C = 477.2°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.8  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 6.01  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYLENE GLYCOL DIBUTYL ETHER

EGB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.334 0.346 0.359 0.372 0.384 0.396 0.408 0.420 0.432 0.443 0.455 0.466 0.476 0.487 0.498 0.508 0.518 0.528 0.538 0.548 0.557 0.566 0.576 0.585 0.593

# ETHYLENE GLYCOL DIMETHYL ETHER

EGD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ansul ether 12' Ansul ether 121 1,2-Dimethoxyethane Dimethyl cellosolve Monoglyme	Liquid  Colorless  Fragrant odor  Floats and mixes with water. Irritating vapor is produced.
Call fire department. Avoid inhalation. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Not irritating to skin. If swallowed, will cause nausea, vomiting or loss of consciousness. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{OCH}_2\text{CH}_2\text{OCH}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Vinyl (not rubber) protective gloves; safety glasses or goggles.  
3.2 Symptoms Following Exposure: If ingested causes nausea, vomiting, cramps, weakness, coma.  
3.3 Treatment of Exposure: INHALATION: oxygen and artificial respiration as needed. INGESTION gastric lavage with water-mineral oil.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 1;  $\text{LD}_{50}$  = 5 to 15 g/kg (adult albino rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: None  
3.11 Liquid or Solid Characteristics: None  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 29°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Containers may explode in fires.  
4.7 Auto Ignition Temperature: 395°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: 4.9 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 26.2 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 9.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 90.12  
9.3 Boiling Point at 1 atm: 185.4°F = 85.2°C = 358.4°K  
9.4 Freezing Point: -92°F = -69°C = 204°K  
9.5 Critical Temperature: 505.4°F = 263°C = 536.2°K  
9.6 Critical Pressure: 561 psia = 38.2 atm = 3.87 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.868 at 20°C (liquid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 3.1  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.071  
9.12 Latent Heat of Vaporization: 134 Btu/lb = 74.6 cal/g =  $3.12 \times 10^5$  J/kg  
9.13 Heat of Combustion: -12,020 Btu/lb = -6680 cal/g =  $-279.7 \times 10^3$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: (est.) -9 Btu/lb = -5 cal/g =  $-0.2 \times 10^5$  J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ETHYLENE GLYCOL DIMETHYL ETHER

EGD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	55.440	15	0.428		N		N
40	55.250	20	0.431		O		O
45	55.060	25	0.434		T		T
50	54.860	30	0.437				
55	54.670	35	0.440		P		P
60	54.480	40	0.442		E		E
65	54.290	45	0.445		R		R
70	54.090	50	0.448		T		T
75	53.900	55	0.451		I		I
80	53.710	60	0.453		N		N
85	53.520	65	0.456		E		E
90	53.320	70	0.459		N		N
95	53.130	75	0.462		T		T
100	52.940	80	0.465				
105	52.750	85	0.467				
110	52.550						
115	52.360						
120	52.170						
125	51.980						
130	51.780						
135	51.590						
140	51.400						
145	51.210						
150	51.010						
155	50.820						
160	50.630						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	0	0.118	0	0.00216	0	0.304
	I	5	0.141	5	0.00255	25	0.315
	S	10	0.168	10	0.00301	50	0.325
	C	15	0.200	15	0.00353	75	0.336
	I	20	0.236	20	0.00413	100	0.346
	B	25	0.278	25	0.00482	125	0.356
	L	30	0.326	30	0.00560	150	0.366
	E	35	0.382	35	0.00648	175	0.376
		40	0.446	40	0.00749	200	0.385
		45	0.518	45	0.00862	225	0.395
		50	0.601	50	0.00990	250	0.404
		55	0.695	55	0.01134	275	0.414
		60	0.801	60	0.01295	300	0.423
		65	0.921	65	0.01475	325	0.432
		70	1.057	70	0.01675	350	0.441
		75	1.209	75	0.01898	375	0.450
		80	1.380	80	0.02146	400	0.459
		85	1.570	85	0.02420	425	0.467
		90	1.783	90	0.02724	450	0.476
		95	2.021	95	0.03058	475	0.484
		100	2.284	100	0.03427	500	0.492
		105	2.577	105	0.03831	525	0.500
		110	2.901	110	0.04275	550	0.508
		115	3.258	115	0.04760	575	0.516
		120	3.653	120	0.05291	600	0.524
		125	4.087	125	0.05869		

# ETHYLENE GLYCOL MONOETHYL ETHER

EGE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cellosolve Dowanol EE 2-Ethoxyethanol Ethylene glycol ethyl ether Glycol monoethyl ether Poly-solv EE	Oily liquid  Colorless  Sweet odor  Floats and mixes with water.
<b>Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ether
- 2.2 Formula:  $\text{HOCH}_2\text{CH}_2\text{OCH}_2\text{CH}_3$
- 2.3 IMO/UN Designation: 3.3/1171
- 2.4 DOT ID No.: 1171
- 2.5 CAS Registry No.: 110-80-5
- 2.6 NAERG Guide No.: 127
- 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic gas mask; goggles or face shield; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Some eye irritation. Inhalation of vapors causes irritation of nose.
- 3.3 **Treatment of Exposure:** Flush eyes with water for 15 min. Flush skin with large volumes of water. Call a physician.
- 3.4 **TLV-TWA:** 5 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat, rabbit, guinea pig)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 500 ppm
- 3.14 **OSHA PEL-TWA:** 200 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 120°F O.C. 202°F C.C.
- 4.2 **Flammable Limits in Air:** 1.8%-14.0%
- 4.3 **Fire Extinguishing Agents:** Alcohol foam, carbon dioxide or dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 455°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 2.4 mm/min
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 1.58 lb/lb, 5 days; 54% (theor.), 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 0
  - Human Oral hazard: 1
  - Human Contact hazard: II
  - Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** U359
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 90.12
- 9.3 **Boiling Point at 1 atm:** 275.2°F = 135.1°C = 408.3°K
- 9.4 **Freezing Point:** -93.0°F = -69.4°C = 203.3°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.931 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.064
- 9.12 **Latent Heat of Vaporization:** 191 Btu/lb = 106 cal/g =  $4.44 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** (est.) -13,000 Btu/lb = -7,400 cal/g =  $-310 \times 10^5$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g =  $-0.2 \times 10^5$  J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.1 psia

### NOTES



# ETHYLENE GLYCOL MONOETHYL ETHER

EGE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	59.090	35	0.562	90	1.194	N O T  P E R T I N E N T	
50	58.760	40	0.564	95	1.186		
60	58.420	45	0.567	100	1.177		
70	58.090	50	0.570	105	1.169		
80	57.750	55	0.573	110	1.160		
90	57.410	60	0.575	115	1.152		
100	57.080	65	0.578	120	1.144		
110	56.740	70	0.581	125	1.135		
120	56.400	75	0.584	130	1.127		
130	56.070	80	0.587	135	1.118		
140	55.730	85	0.589	140	1.110		
150	55.390	90	0.592	145	1.102		
160	55.060	95	0.595	150	1.093		
170	54.720	100	0.598				
180	54.390						
190	54.050						
200	53.710						
210	53.380						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		60	0.052	60	0.00085	0	0.337
		70	0.078	70	0.00124	25	0.347
		80	0.114	80	0.00177	50	0.357
		90	0.164	90	0.00250	75	0.367
		100	0.231	100	0.00346	100	0.377
		110	0.320	110	0.00472	125	0.386
		120	0.438	120	0.00634	150	0.396
		130	0.590	130	0.00840	175	0.405
		140	0.785	140	0.01099	200	0.415
		150	1.031	150	0.01420	225	0.424
		160	1.340	160	0.01816	250	0.433
		170	1.722	170	0.02297	275	0.441
		180	2.192	180	0.02877	300	0.450
		190	2.762	190	0.03570	325	0.459
		200	3.451	200	0.04392	350	0.467
		210	4.274	210	0.05359	375	0.476
		220	5.253	220	0.06488	400	0.484
		230	6.406	230	0.07798	425	0.492
		240	7.758	240	0.09308	450	0.500
		250	9.331	250	0.11040	475	0.508
		260	11.150	260	0.13010	500	0.515
		270	13.250	270	0.15240	525	0.523
		280	15.650	280	0.17760	550	0.530
		290	18.380	290	0.20580	575	0.538
		300	21.470	300	0.23730	600	0.545

# ETHYLENE GLYCOL ISOPROPYL ETHER

EGI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dowanol eipat Ethanol, 2-isopropoxy b-Hydroxyethyl isopropyl ether 2-Isopropoxyethanol Isopropyl cellosolve Isopropyl glycol	Liquid
<b>Call fire department. Wear self-contained breathing apparatus and protective equipment. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	COMBUSTIBLE. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, immediately induce vomiting.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Dilute and disperse	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 40; Glycol ethers 2.2 Formula: (CH <sub>3</sub> ) <sub>2</sub> CHOCH <sub>2</sub> CH <sub>2</sub> OH 2.3 IMO/UN Designation: Currently not available 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 109-59-1 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51616
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Wear approved respirator, chemical resistant gloves, chemical safety goggles or full-face mask, boots, and apron. 3.2 <b>Symptoms Following Exposure:</b> May be harmful by inhalation, ingestion or skin absorption. May cause skin and eye irritation. 3.3 <b>Treatment of Exposure:</b> INHALATION: Consult a physician. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Immediately induce vomiting. EYES: Immediately flush with plenty of water for at least 15 minutes. SKIN: Wash with soap and water. 3.4 <b>TLV-TWA:</b> 25 ppm 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 4.9 g/kg (mouse) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 91.4°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, carbon dioxide, dry chemical, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Emits toxic fumes when heated upon decomposition.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 104.15  
9.3 **Boiling Point at 1 atm:** 285.8°F = 141°C = 414.2°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.91  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.59  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# ETHYLENE GLYCOL ISOPROPYL ETHER

EGI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	68	0.027		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.329 0.341 0.353 0.364 0.376 0.387 0.398 0.408 0.419 0.429 0.439 0.449 0.459 0.469 0.479 0.488 0.497 0.506 0.515 0.524 0.532 0.540 0.549 0.557 0.565

# ETHYLENE GLYCOL

EGL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Dihydroxyethane 1,2-Ethanediol Ethylene dihydrate Glycol Monoethylene glycol	Thick liquid      Colorless      Odorless  Sinks and mixes with water.
Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed, will cause loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol
- 2.2 Formula: HOCH<sub>2</sub>CH<sub>2</sub>OH
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 107-21-1
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51221

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles; shower and eye bath.
- 3.2 Symptoms Following Exposure: Inhalation of vapor is not hazardous. Ingestion causes stupor or coma, sometimes leading to fatal kidney injury.
- 3.3 Treatment of Exposure: INGESTION: induce vomiting and call a physician. SKIN AND EYES: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: 100 mg/m<sup>3</sup>
- 3.7 Toxicity by Ingestion: Grade 1; LD<sub>50</sub> = 5 to 15 g/kg (rat, guinea pig, mouse)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Fatal kidney injury may result if ingested.
- 3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat.
- 3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 240°F O.C. 232°F C.C.
- 4.2 Flammable Limits in Air: LEL = 3.2%; UEL not listed
- 4.3 Fire Extinguishing Agents: Water fog, alcohol foam, carbon dioxide, or dry chemical
- 4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: 775°F
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: 1.0 mm/min.
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 11.9 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 5.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: >100 ppm/48 hr/shrimp/LC<sub>50</sub>/salt water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): 12.5% (theor.), 5 days; 78% (theor.), 20 days
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:  
 Bioaccumulation: 0  
 Damage to living resources: 0  
 Human Oral hazard: 2  
 Human Contact hazard: II  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Industrial grade; low-conductivity grade
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open (flame arrester)
- 7.5 IMO Pollution Category: D
- 7.6 Ship Type: Data not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: 5000 pounds
- 8.7 EPA Pollution Category: D
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 62.07
- 9.3 Boiling Point at 1 atm: 387.°F = 197.6°C = 470.8°K
- 9.4 Freezing Point: 8.6°F = 13°C = 260°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.115 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): 1.095
- 9.12 Latent Heat of Vaporization: 344 Btu/lb = 191 cal/g = 8.00 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: -7259 Btu/lb = -4033 cal/g = -168.9 X 10<sup>5</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: (est.) -20 Btu/lb = -12 cal/g = -0.5 X 10<sup>5</sup> J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: 43.26 cal/g
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: 0.008 psia

### NOTES

# ETHYLENE GLYCOL

EGL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	70.129	20	0.536	75	1.700	N O T  P E R T I N E N T	
50	69.910	40	0.549	80	1.697		
60	69.690	60	0.563	85	1.694		
70	69.459	80	0.576	90	1.691		
80	69.209	100	0.589	95	1.688		
90	68.959	120	0.603	100	1.685		
100	68.690	140	0.616	105	1.683		
110	68.419	160	0.629	110	1.680		
120	68.129	180	0.643	115	1.677		
130	67.830	200	0.656	120	1.674		
140	67.520	220	0.669	125	1.671		
150	67.200	240	0.683	130	1.668		
160	66.870	260	0.696	135	1.665		
170	66.530	280	0.709	140	1.662		
180	66.179	300	0.723	145	1.659		
190	65.820			150	1.656		
200	65.440			155	1.653		
210	65.059			160	1.650		
				165	1.647		
				170	1.644		
				175	1.641		
				180	1.638		
				185	1.635		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		60	0.001	60	0.00001	0	0.344
		70	0.001	70	0.00001	25	0.354
		80	0.002	80	0.00002	50	0.364
		90	0.003	90	0.00003	75	0.373
		100	0.005	100	0.00005	100	0.382
		110	0.008	110	0.00008	125	0.391
		120	0.012	120	0.00012	150	0.400
		130	0.017	130	0.00017	175	0.409
		140	0.026	140	0.00025	200	0.417
		150	0.037	150	0.00035	225	0.425
		160	0.053	160	0.00050	250	0.433
		170	0.075	170	0.00069	275	0.440
		180	0.106	180	0.00095	300	0.448
		190	0.146	190	0.00130	325	0.455
		200	0.201	200	0.00176	350	0.462
		210	0.273	210	0.00236	375	0.468
		220	0.369	220	0.00314	400	0.475
		230	0.493	230	0.00413	425	0.481
		240	0.653	240	0.00540	450	0.487
		250	0.859	250	0.00700	475	0.493
		260	1.120	260	0.00900	500	0.498
		270	1.451	270	0.01150	525	0.504
		280	1.867	280	0.01460	550	0.509
		290	2.386	290	0.01840	575	0.514
		300	3.029	300	0.02305	600	0.518

# ETHYLENE GLYCOL MONOBUTYL ETHER

EGM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Butoxyethanol Butyl cellosolve Dowanol EB Glycol butyl ether Poly-solv EB	Oily liquid      Colorless      Mild rancid odor  Floats and mixes with water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 40; Glycol ether  
 2.2 Formula:  $\text{CH}_2(\text{CH}_2)_2\text{OCH}_2\text{CH}_2\text{OH}$   
 2.3 IMO/UN Designation: Not listed  
 2.4 DOT ID No.: 2369  
 2.5 CAS Registry No.: 111-76-2  
 2.6 NAERG Guide No.: 152  
 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air pack or organic canister respirator; rubber gloves; goggles; clothing to prevent body contact with liquid.  
 3.2 **Symptoms Following Exposure:** Vapors irritate eyes and nose. Ingestion or skin contact causes headache, nausea, vomiting, dizziness.  
 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air and call a physician. SKIN OR EYES: immediately flush with plenty of water; get medical care for eyes.  
 3.4 TLV-TWA: 25 ppm  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** 700 ppm  
 3.14 OSHA PEL-TWA: 50 ppm  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 165°F O.C. 155°F C.C.  
 4.2 **Flammable Limits in Air:** 1.1%-10.6%  
 4.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires;; alcohol-type foam for large fires.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 472°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 6.7 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 1000 ppm/24 hr/brine shrimp/TL<sub>m</sub>  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** 26% of theoretical in 5 days, fresh water  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 1  
 Human Oral hazard: 2  
 Human Contact hazard: II  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** D  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food  
 8.2 49 CFR Class: 6.1  
 8.3 49 CFR Package Group: III  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
 9.2 Molecular Weight: 118.18  
 9.3 Boiling Point at 1 atm: 340.2°F = 171.2°C = 444.4°K  
 9.4 Freezing Point: -103°F = -75°C = 198°K  
 9.5 Critical Temperature: 694.4°F = 368°C = 641.2°K  
 9.6 Critical Pressure: 470 psia = 32 atm = 3.2 MN/m<sup>2</sup>  
 9.7 Specific Gravity: 0.902 at 20°C (liquid)  
 9.8 Liquid Surface Tension: Not pertinent  
 9.9 Liquid Water Interfacial Tension: Not pertinent  
 9.10 Vapor (Gas) Specific Gravity: Not pertinent  
 9.11 Ratio of Specific Heats of Vapor (Gas): 1.047  
 9.12 Latent Heat of Vaporization: 157 Btu/lb = 87.1 cal/g = 3.65 X 10<sup>5</sup> J/kg  
 9.13 Heat of Combustion: -13,890 Btu/lb = -7720 cal/g = -323 X 10<sup>5</sup> J/kg  
 9.14 Heat of Decomposition: Not pertinent  
 9.15 Heat of Solution: (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg  
 9.16 Heat of Polymerization: Not pertinent  
 9.17 Heat of Fusion: Currently not available  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: 2.2 psia

### NOTES

# ETHYLENE GLYCOL MONOBUTYL ETHER

EGM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	57.180	15	0.440	85	1.106	N O T  P E R T I N E N T	
50	56.860	20	0.443	90	1.099		
60	56.540	25	0.446	95	1.092		
70	56.230	30	0.449	100	1.084		
80	55.910	35	0.452	105	1.077		
90	55.600	40	0.454	110	1.070		
100	55.280	45	0.457	115	1.063		
110	54.970	50	0.460	120	1.056		
120	54.650	55	0.463	125	1.049		
130	54.340	60	0.465	130	1.041		
140	54.020	65	0.468	135	1.034		
150	53.700	70	0.471	140	1.027		
160	53.390	75	0.474	145	1.020		
170	53.070	80	0.477	150	1.013		
180	52.760	85	0.479				
190	52.440						
200	52.130						
210	51.810						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		60	0.008	60	0.00018	0	0.344
		70	0.013	70	0.00026	25	0.355
		80	0.018	80	0.00038	50	0.366
		90	0.027	90	0.00054	75	0.378
		100	0.038	100	0.00076	100	0.389
		110	0.054	110	0.00105	125	0.399
		120	0.076	120	0.00145	150	0.410
		130	0.105	130	0.00197	175	0.420
		140	0.144	140	0.00265	200	0.431
		150	0.195	150	0.00352	225	0.441
		160	0.262	160	0.00465	250	0.451
		170	0.348	170	0.00608	275	0.461
		180	0.458	180	0.00788	300	0.470
		190	0.598	190	0.01013	325	0.480
		200	0.774	200	0.01292	350	0.489
		210	0.995	210	0.01635	375	0.498
		220	1.269	220	0.02055	400	0.507
		230	1.607	230	0.02566	425	0.516
		240	2.022	240	0.03182	450	0.525
		250	2.528	250	0.03921	475	0.534
		260	3.140	260	0.04804	500	0.542
		270	3.878	270	0.05851	525	0.550
		280	4.761	280	0.07087	550	0.559
		290	5.815	290	0.08539	575	0.567
		300	7.064	300	0.10240	600	0.575
		310	8.538	310	0.12210		

# ETHYLENE GLYCOL ACETATE

EGO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Ethanediol, monoacetate Ethylene glycol monoacetate Glycol monoacetate Glycol-monoacetin 2-Hydroxyethyl acetate	Liquid	Colorless	Weak fruity odor
Sinks and mixes with water.			
<b>Keep people away.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, alcohol foam, or CO <sub>2</sub> .		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula: CH<sub>3</sub>CO:CH<sub>2</sub>CH<sub>2</sub>OH  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 542-59-6  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield, and rubber gloves.  
3.2 **Symptoms Following Exposure:** Exposure to liquid may cause eye irritation. Ingestion may cause stupor.  
3.3 **Treatment of Exposure:** Call a physician. EYES: Flush with water. SKIN: Flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 3.8 g/kg (guinea pig)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard; practically harmless to skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 191°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, alcohol foam, dry chemical or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Not pertinent.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 50%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Ambient  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 104.10  
9.3 **Boiling Point at 1 atm:** 368.6-372.2°F = 187-189°C = 460.2-462.2°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.110  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.59  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ETHYLENE GLYCOL ACETATE

EGO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.268 0.277 0.285 0.293 0.301 0.308 0.316 0.324 0.331 0.339 0.346 0.353 0.360 0.367 0.374 0.381 0.388 0.394 0.401 0.407 0.413 0.419 0.426 0.432 0.437

# ETHYLENE GLYCOL PROPYL ETHER

EGP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ektasolve EP Ethylene glycol monopropyl ether	Liquid  Colorless  Mild rancid odor  Floats and mixes with water.
Remove all ignition sources. Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ethers  
2.2 Formula:  $\text{CH}_2\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{OH}$   
2.3 IMO/UN Designation: Not listed.  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 2807-30-9  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator; rubber gloves; goggles; clothing to prevent body contact with liquid.  
3.2 **Symptoms Following Exposure:** Vapors irritate eyes and nose. Can cause corneal damage. Inhalation or skin contact can cause toxic effects.  
3.3 **Treatment of Exposure:** Call for medical aid. INHALATION: Remove to fresh air. SKIN OR EYES: Immediately flush with plenty of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May cause anemia and kidney damage.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 120°F C.C.  
4.2 **Flammable Limits in Air:** LEL: 1.26% @ 69°C; UEL: 15.8% @ 127°C  
4.3 **Fire Extinguishing Agents:** Alcohol foam, water spray, dry chemical or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Carbon dioxide and carbon monoxide may be produced in a fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Incompatible with oxidizing materials.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 104.15  
9.3 **Boiling Point at 1 atm:** 301°F = 149.5°C = 422.5°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.908 at 73°F  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.6  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYLENE GLYCOL PROPYL ETHER

EGP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
73	7.580		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	77	0.025	77	0.00045		C U R R E N T L Y  N O T  A V A I L A B L E

# ETHYLENE GLYCOL METHYL ETHER ACETATE

EGT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethylene glycol monomethyl ether acetate Glycol monomethyl ether acetate 2-Methoxyethyl acetate Methyl cellosolve acetate	Liquid Colorless Mild, ether-like  Soluble in water.
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with water spray, dry chemical, alcohol foam, carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, induce vomiting.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
 2.2 Formula:  $\text{CH}_3\text{COOCH}_2\text{CH}_2\text{OCH}_3$   
 2.3 IMO/UN Designation: Currently not available  
 2.4 DOT ID No.: 1189  
 2.5 CAS Registry No.: 110-49-6  
 2.6 NAERG Guide No.: 129  
 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Impervious clothing and gloves should be used to prevent skin contact. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** May cause irritation if splashed into eyes. Can be absorbed through the skin. Swallowing a large single dose or absorbing large amount through skin could result in death. It is unlikely that air levels of the compound would be dangerous unless it is heated.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. Contact lenses should not be worn when working with this chemical. SKIN: Remove contaminated clothing and shoes. Flush with water. INGESTION: Induce vomiting.
- 3.4 TLV-TWA: 5 ppm.  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2: oral rat  $\text{LD}_{50}$  = 3.39 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Repeated or prolonged overexposure may cause lung or kidney damage, brain damage, and death.  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
 3.12 **Odor Threshold:** 50 ppm.  
 3.13 **IDLH Value:** 200 ppm  
 3.14 **OSHA PEL-TWA:** 25 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 111°F C.C.  
 4.2 **Flammable Limits in Air:** LEL: 1.5% @ 200°F; UEL: 12.3% @ 200°F.  
 4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, alcohol foam, or carbon dioxide.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
 4.5 **Special Hazards of Combustion:** Products: Irritating vapors and toxic gases, such as carbon monoxide, may be formed when involved in fire.  
 4.6 **Behavior in Fire:** Currently not available  
 4.7 **Auto Ignition Temperature:** 740°F.  
 4.8 **Electrical Hazards:** Not listed.  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** 425°F.  
 4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
 5.2 **Reactivity with Common Materials:** Contact with nitrates, strong oxidizers, strong alkalis, and strong acids may cause fires and explosions.  
 5.3 **Stability During Transport:** Stable.  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
 5.5 **Polymerization:** Will not polymerize.  
 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 190 mg/l /24 hr/goldfish/LC<sub>50</sub>  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** 0.41 - 1.82 g/g.  
 6.4 **Food Chain Concentration Potential:** Currently not available  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 2  
 Human Oral hazard: 1  
 Human Contact hazard: II  
 Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%; technical.  
 7.2 **Storage Temperature:** Ambient.  
 7.3 **Inert Atmosphere:** No requirement.  
 7.4 **Venting:** Not listed.  
 7.5 **IMO Pollution Category:** C  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
 8.2 49 CFR Class: 3  
 8.3 49 CFR Package Group: III  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	-

 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 118.13  
 9.3 **Boiling Point at 1 atm:** 293°F = 145°C = 418°K  
 9.4 **Freezing Point:** -85°F = -65°C = 208°K  
 9.5 **Critical Temperature:** Currently not available  
 9.6 **Critical Pressure:** Currently not available  
 9.7 **Specific Gravity:** 1.006 @ 20°C  
 9.8 **Liquid Surface Tension:** Currently not available  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** 4.1  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
 9.12 **Latent Heat of Vaporization:** Currently not available  
 9.13 **Heat of Combustion:** Currently not available  
 9.14 **Heat of Decomposition:** Currently not available  
 9.15 **Heat of Solution:** Currently not available  
 9.16 **Heat of Polymerization:** Not pertinent.  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYLENE GLYCOL METHYL ETHER ACETATE

EGT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	8.400		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	68	0.039	68	0.00081		C U R R E N T L Y  N O T  A V A I L A B L E

# ETHYLENE GLYCOL DIACETATE

EGY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethylene acetate Ethylene diacetate Glycol diacetate	Liquid  Colorless  Weak fruity odor  Sinks and mixes with water.
Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, alcohol foam, or carbon dioxide.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{COOCH}_2\text{CH}_2\text{OCOCH}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 111-55-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Inhalation is not hazardous. Liquid causes mild irritation of eyes. Ingestion causes stupor or coma.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air. EYES and SKIN: flush well with water. INGESTION: induce vomiting; call a physician.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; oral  $\text{LD}_{50}$  = 6,860 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Ingestion may cause severe injury to kidneys.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 205°F O.C. 191°F C.C.  
4.2 **Flammable Limits in Air:** 1.6%-8.4%  
4.3 **Fire Extinguishing Agents:** Water, alcohol foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 900°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 2.9 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 146.1  
9.3 **Boiling Point at 1 atm:** 375.6°F = 190.9°C = 464.1°K  
9.4 **Freezing Point:** -42.7°F = -41.5°C = 231.7°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.104 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 133 Btu/lb = 74 cal/g =  $3.1 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** (est.) -11,000 Btu/lb = -6,000 cal/g =  $-250 \times 10^3$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYLENE GLYCOL DIACETATE

EGY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	70.169	52	0.471	42	1.048	34	4.744
40	69.980	54	0.472	44	1.048	36	4.600
45	69.790	56	0.473	46	1.048	38	4.461
50	69.599	58	0.474	48	1.048	40	4.328
55	69.410	60	0.476	50	1.048	42	4.199
60	69.219	62	0.477	52	1.048	44	4.075
65	69.030	64	0.478	54	1.048	46	3.956
70	68.839	66	0.479	56	1.048	48	3.841
75	68.650	68	0.480	58	1.048	50	3.731
80	68.459	70	0.481	60	1.048	52	3.624
85	68.270	72	0.482	62	1.048	54	3.521
90	68.070	74	0.483	64	1.048	56	3.422
95	67.879	76	0.484	66	1.048	58	3.327
100	67.690	78	0.486	68	1.048	60	3.234
105	67.500	80	0.487	70	1.048	62	3.146
110	67.309	82	0.488	72	1.048	64	3.060
115	67.120	84	0.489	74	1.048	66	2.977
120	66.929	86	0.490	76	1.048	68	2.897
						70	2.819
						72	2.745
						74	2.673
						76	2.603
						78	2.535
						80	2.470
						82	2.407
						84	2.346

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	16.400	160	0.135	160	0.00297	N O T  P E R T I N E N T	
		170	0.181	170	0.00390		
		180	0.239	180	0.00508		
		190	0.313	190	0.00656		
		200	0.407	200	0.00839		
		210	0.525	210	0.01066		
		220	0.671	220	0.01345		
		230	0.853	230	0.01684		
		240	1.077	240	0.02095		
		250	1.351	250	0.02590		
		260	1.683	260	0.03183		
		270	2.085	270	0.03888		
		280	2.567	280	0.04723		
		290	3.144	290	0.05707		
		300	3.829	300	0.06860		
		310	4.641	310	0.08206		
		320	5.596	320	0.09769		
		330	6.716	330	0.11580		
		340	8.024	340	0.13660		
		350	9.545	350	0.16040		
		360	11.310	360	0.18770		
		370	13.340	370	0.21880		

# ETHYLHEXALDEHYDE

EHA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butylethylacetaldehyde 2-Ethylcaproaldehyde 2-Ethyl hexaldehyde 2-Ethylhexanal Octyl aldehyde	Liquid                      White                      Mild odor  Floats on water.
Keep people away. Avoid contact with liquid. Wear goggles, self-contained breathing apparatus, and rubber overclothing. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn  
 Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 19; Aldehyde  
 2.2 Formula: C<sub>8</sub>H<sub>16</sub>CH(C<sub>2</sub>H<sub>5</sub>)CHO  
 2.3 IMO/UN Designation: 3.3/1191  
 2.4 DOT ID No.: 1191  
 2.5 CAS Registry No.: 123-05-7  
 2.6 NAERG Guide No.: 129  
 2.7 Standard Industrial Trade Classification: 51622

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; safety goggles or face shield  
 3.2 **Symptoms Following Exposure:** Inhalation may be irritating to mucous membrane; overexposure may cause dizziness and collapse. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation.  
 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give oxygen if breathing is difficult; call a doctor. EYES: irrigate immediately for 15 min., then get medical attention. SKIN: flush with water; wash with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 3,730 mg/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 127°F O.C. 112°F C.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
 4.5 **Special Hazards of Combustion Products:** Currently not available  
 4.6 **Behavior in Fire:** Currently not available  
 4.7 **Auto Ignition Temperature:** 387°F  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 54.7 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** May ignite spontaneously when spilled on clothing, paper, or other absorbent materials  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: T  
 Damage to living resources: 3  
 Human Oral hazard: 1  
 Human Contact hazard: I  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 95.0+%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Pressure-vacuum  
 7.5 **IMO Pollution Category:** B  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** III  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	1

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 128.22  
 9.3 **Boiling Point at 1 atm:** 327°F = 164°C = 437°K  
 9.4 **Freezing Point:** Not pertinent  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.820 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** Currently not available  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** 164 Btu/lb = 91.2 cal/g = 3.82 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -15,860 Btu/lb = -8,810 cal/g = -369 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ETHYLHEXALDEHYDE

EHA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	51.740		N		N		N
54	51.670		O		O		O
56	51.600		T		T		T
58	51.530						
60	51.460		P		P		P
62	51.390		E		E		E
64	51.320		R		R		R
66	51.260		T		T		T
68	51.190		I		I		I
70	51.120		N		N		N
72	51.050		E		E		E
74	50.980		N		N		N
76	50.910		T		T		T
78	50.840						
80	50.770						
82	50.700						
84	50.630						
86	50.560						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.041	70	0.00093		N
	N	80	0.058	80	0.00128		O
	S	90	0.079	90	0.00173		T
	O	100	0.108	100	0.00231		
	L	110	0.146	110	0.00306		P
	U	120	0.195	120	0.00401		E
	B	130	0.257	130	0.00521		R
	L	140	0.337	140	0.00671		T
	E	150	0.437	150	0.00856		I
		160	0.562	160	0.01083		N
		170	0.717	170	0.01361		E
		180	0.908	180	0.01696		R
		190	1.142	190	0.02100		T
		200	1.426	200	0.02582		I
		210	1.769	210	0.03155		N
		220	2.180	220	0.03832		E
		230	2.671	230	0.04626		N
		240	3.253	240	0.05554		T
		250	3.940	250	0.06632		
		260	4.747	260	0.07879		
		270	5.690	270	0.09315		
		280	6.788	280	0.10960		
		290	8.058	290	0.12840		
		300	9.523	300	0.14970		
		310	11.210	310	0.17390		
		320	13.130	320	0.20120		

# 2-ETHYLHEXYL ACETATE

EHC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Octyl acetate	Liquid	Colorless	Mild odor
Floats on water.			
<b>Avoid inhalation.</b> <b>Wear full impervious protective clothing and approved respirator.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with alcohol foam, dry chemical, or carbon dioxide.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** CH<sub>3</sub>COOCH<sub>2</sub>CH(CH<sub>2</sub>H<sub>5</sub>)C<sub>4</sub>H<sub>9</sub>  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** 103-09-3  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Impervious clothing and gloves should be used to prevent skin contact. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Prolonged skin contact may cause irritation.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water. INGESTION: Have the victim drink water or milk.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 160°F C.C.  
4.2 **Flammable Limits in Air:** LEL: 0.76% @ 200°F; UEL: 8.14% @ 300°F.  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Use water with caution. Since the material is lighter than water and virtually insoluble, the fire could easily be spread by use of water in an uncontained area.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 66.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 20.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Contact with strong oxidizers may cause vigorous reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 172.27  
9.3 **Boiling Point at 1 atm:** 378°F = 192°C = 465°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.873 @ 20°C.  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 5.93  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2-ETHYLHEXYL ACETATE

EHC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	7.290		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	N E G L I G I B L E	68	0.008	68	0.00023		C U R R E N T L Y  N O T  A V A I L A B L E

# ETHYL HEXYL PHTHALATE

EHE

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Oily liquid

Colorless to pale yellow

Slight to no odor

**Wear goggles, gloves and approved respirator.**  
**Shut off ignition sources and call fire department.**  
**Notify local health and pollution control agencies.**  
**Protect water intakes.**

### Fire

Combustible.  
 Toxic gases, such as carbon monoxide, may be produced in fire.  
 Overheating of containers can result in rupture.  
 Wear full protective clothing with self-contained breathing apparatus.  
 Extinguish fire with carbon dioxide, dry chemical, alcohol foam, or water spray.  
 Protect water intakes.  
 Cool fire-exposed containers with water spray.  
 Do not spray fire directly; solid stream could cause frothing.

### Exposure

CALL FOR MEDICAL AID.

#### VAPOR

Move victim to fresh air.  
 If breathing is difficult, give oxygen.

#### LIQUID

Irritating to skin and eyes.  
 Remove contaminated clothing and shoes.  
 Wash affected areas with soap and water.  
 IF IN EYES, hold eyelids open and flush with plenty of water.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
 May be dangerous if it enters water intakes.  
 Notify local health and wildlife officials.  
 Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim; Pump  
 Clean shore line  
 Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters
- 2.2 Formula:  $C_{12}H_{22}O_4$
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: Not listed.
- 2.5 CAS Registry No.: 117-81-7
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51385

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety goggles or full face shield; approved organic vapor respirator; chemically resistant gloves.
- 3.2 **Symptoms Following Exposure:** Inhalation can cause nausea and irritation of nose and throat. Contact of liquid with eyes or skin causes irritation. Ingestion can cause abdominal cramps, nausea and diarrhea.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. EYES: Flush with water for at least 15 min. SKIN: Wash with soap and water.
- 3.4 **TLV-TWA:** 5 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; oral rat LD<sub>50</sub> = 30.6 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Listed as a potential carcinogen based upon increased incidence of liver cancers in female rats and mice; and an increased incidence of liver cancers or neoplasms in male rats.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 5,000 mg/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 5 mg/m<sup>3</sup>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 425°F O.C.
- 4.2 **Flammable Limits in Air:** LEL: 0.31% @ 493°F.; 0.28% @ 507°F.
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam, or water spray.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.
- 4.6 **Behavior in Fire:** Overheating of containers during fire can result in rupture.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 149.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 43.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Oxidizing materials can cause a vigorous reaction.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 >550 mg/l/96 hr/sheepshead minnow/LC<sub>50</sub>  
 11 mg/l/48 hr/water flea/LC<sub>50</sub>
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Open.
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 390.56
- 9.3 **Boiling Point at 1 atm:** 724°F = 384°C = 657°K
- 9.4 **Freezing Point:** <58°F = <50°C = <323°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.98 at 25°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 16
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# ETHYL HEXYL PHTHALATE

EHE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	8.180		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	N E G L I G I B L E	68	0.026	68	0.00176		C U R R E N T L Y  N O T  A V A I L A B L E

# 2-ETHYLHEXYLAMINE

EHM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Amino-2-ethylhexane 2-Ethyl-1-hexylamine beta-Ethylhexylamine	Liquid  Colorless  Musky ammonia  Floats on water.
Keep people away. Avoid contact with liquid. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with alcohol foam, CO <sub>2</sub> , dry powder or water spray. Dilution with water will reduce intensity of flame.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amine  
2.2 Formula: C<sub>8</sub>H<sub>17</sub>CH(C<sub>2</sub>H<sub>5</sub>)CH<sub>2</sub>NH<sub>2</sub>  
2.3 IMO/UN Designation: 8/2276  
2.4 DOT ID No.: 2276  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air supplied or cartridge respirator, impermeable gloves, apron, and boots if condition warrants. Face shield or splash proof goggles and other protective equipment as necessary to prevent skin contact.
- 3.2 **Symptoms Following Exposure:** INHALATION: High concentration of vapor will produce irritation of the respiratory tract and the lungs. Prolonged exposure may cause systemic effects. EYES: Contact with liquid may result in severe eye irritation. Exposure to concentrated vapor may result in corneal edema. SKIN: Contact with liquid may result in severe skin irritation, burns and possible skin absorption. INGESTION: May cause systemic poisoning.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. Aid breathing if necessary. EYES: Immediately flush with water for at least 15 minutes. SKIN: Immediately flush areas of contact with water for at least 15 minutes while removing contaminated clothing and shoes. INGESTION: Drink water, lemon juice, milk or demulcents. Do not induce vomiting.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 50-500 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Prolonged exposure to vapor can result in systemic toxic effects.  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 Liquid or Solid Characteristics: Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes of contact.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 140°F O.C. 138.0°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Alcohol foam, carbon dioxide, dry powder or water spray.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Carbon monoxide and/or carbon dioxide and toxic oxides of nitrogen may be produced.  
4.6 Behavior in Fire: Can react vigorously with oxidizing materials.  
4.7 Auto Ignition Temperature: 563°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 65.5 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 18.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.  
5.2 Reactivity with Common Materials: Incompatible with acids and oxidizing materials.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Cover with a 90:10 mixture of sand/soda ash. Place in container. Flush area with water.  
5.5 Polymerization: Does not occur.  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Pseudomonas putida (badena): 82 mg/l  
Scenedesmas quadricauda (green algae): 0.36 mg/l  
Entosiphon sulcatum (protzoa): 12 mg/l  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 98%-99%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: B  
7.6 Ship Type: 2  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 129.25  
9.3 Boiling Point at 1 atm: 337°F = 169°C = 442.2°K  
9.4 Freezing Point: <-94°F = <-70°C = <203.2°K  
9.5 Critical Temperature: 620.6°F = 327.0°C = 600.2°K  
9.6 Critical Pressure: 375 psia = 25.51 atm = 2.58 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.79 at 20°C  
9.8 Liquid Surface Tension: 27.85 dynes/cm = 0.02785 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est) 45.15 dynes/cm = 0.04515 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: 4.45 - 4.5  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# 2-ETHYLHEXYLAMINE

EHM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	77	0.968

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.250	68	0.023		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# 2-ETHYLHEXANOIC ACID

EHO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butylethylacetic acid alpha-Ethylcaproic acid 2-Ethylhexoic acid Hexanoic acid, 2-ethyl-	Liquid	Colorless
<b>Keep people away. Avoid contact with liquid and vapor. Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>		
<b>Fire</b>	Combustible. Water may be ineffective on fire. Wear self-contained breathing apparatus and protective clothing. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> .	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR. Irritating to eyes, nose and throat. If inhaled, will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	May be dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skin	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 4; Organic acids <b>2.2 Formula:</b> CH <sub>3</sub> (CH <sub>2</sub> ) <sub>4</sub> CH(C <sub>2</sub> H <sub>5</sub> )CO <sub>2</sub> H <b>2.3 IMO/UN Designation:</b> Currently not available <b>2.4 DOT ID No.:</b> Not listed <b>2.5 CAS Registry No.:</b> 149-57-5 <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 51377
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Respirator, chemical safety goggles, rubber boots, heavy rubber gloves, and impervious apron. <b>3.2 Symptoms Following Exposure:</b> Harmful if swallowed, inhaled or absorbed through skin. Material is extremely destructive to tissues of mucous membranes and upper respiratory tract, eyes and skin. Inhalation may be fatal as a result of spasm, inflammation and edema of the larynx, bronchii, chemical pneumonitis and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. <b>3.3 Treatment of Exposure:</b> INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing give artificial respiration. If breathing is difficult give oxygen. EYES - OR -SKIN: Flush with copious amounts of water for at least 15 minutes, while removing contaminated clothing and shoes. Ensure adequate flushing of the eyes by separating the eyelids with the fingers. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 3.0 g/kg (rat) <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. <b>3.11 Liquid or Solid Characteristics:</b> Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:**  
> 230°F C.C.
- 4.2 Flammable Limits in Air:** LEL = 1.04% @ 135°C, UEL = 8.64% @ 188°C
- 4.3 Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam, water spray
- 4.4 Fire Extinguishing Agents Not to Be Used:** Water may not be effective
- 4.5 Special Hazards of Combustion Products:** Currently not available
- 4.6 Behavior in Fire:** Currently not available
- 4.7 Auto Ignition Temperature:** 699°F
- 4.8 Electrical Hazards:** Currently not available
- 4.9 Burning Rate:** Currently not available
- 4.10 Adiabatic Flame Temperature:** Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)
- 4.12 Flame Temperature:** Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction
- 5.2 Reactivity with Common Materials:** Corrosive, attacks most common metals
- 5.3 Stability During Transport:** Stable
- 5.4 Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate solution
- 5.5 Polymerization:** Will not occur
- 5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available
- 6.2 Waterfowl Toxicity:** Currently not available
- 6.3 Biological Oxygen Demand (BOD):** Currently not available
- 6.4 Food Chain Concentration Potential:** Currently not available
- 6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 99 + %
- 7.2 Storage Temperature:** Ambient
- 7.3 Inert Atmosphere:** Not required
- 7.4 Venting:** Not required
- 7.5 IMO Pollution Category:** D
- 7.6 Ship Type:** Data not available
- 7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed
- 8.2 49 CFR Class:** Not pertinent.
- 8.3 49 CFR Package Group:** Not listed.
- 8.4 Marine Pollutant:** No
- 8.5 NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity:** Not listed.
- 8.7 EPA Pollution Category:** Not listed.
- 8.8 RCRA Waste Number:** Not listed
- 8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid
- 9.2 Molecular Weight:** 144.21
- 9.3 Boiling Point at 1 atm:** 442.4°F = 228°C = 501.2°K
- 9.4 Freezing Point:** Currently not available
- 9.5 Critical Temperature:** Currently not available
- 9.6 Critical Pressure:** Currently not available
- 9.7 Specific Gravity:** 0.903
- 9.8 Liquid Surface Tension:** Currently not available
- 9.9 Liquid Water Interfacial Tension:** Currently not available
- 9.10 Vapor (Gas) Specific Gravity:** 4.98
- 9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 Latent Heat of Vaporization:** Currently not available
- 9.13 Heat of Combustion:** Currently not available
- 9.14 Heat of Decomposition:** Currently not available
- 9.15 Heat of Solution:** Currently not available
- 9.16 Heat of Polymerization:** Currently not available
- 9.17 Heat of Fusion:** Currently not available
- 9.18 Limiting Value:** Currently not available
- 9.19 Reid Vapor Pressure:** Currently not available

## NOTES



# 2-ETHYLHEXANOIC ACID

EHO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	68 239	0.000 0.193		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.303 0.317 0.330 0.343 0.356 0.368 0.381 0.393 0.405 0.416 0.427 0.439 0.449 0.460 0.470 0.481 0.491 0.500 0.510 0.519 0.529 0.537 0.546 0.555 0.563

# ETHOXYDIHYDROPYRAN

EHP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Ethoxy-3,4-dihydro-2h-pyran		Liquid	Colorless
		Floats on water.	
Keep people away. Shut off ignition sources. Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.		
<b>Exposure</b>	Call for medical aid. Exposure data not available.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{OCH} = \text{CHCH}_2\text{CH}_2\text{CHOC}_2\text{H}_5$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves.  
3.2 Symptoms Following Exposure: Contact with liquid irritates eyes. Also irritates skin on prolonged contact.  
3.3 Treatment of Exposure: EYES: flush with water for at least 15 min. SKIN: wipe off; wash well with soap and water. INGESTION: induce vomiting; get medical attention.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 98°F O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: 4.8 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 42.8 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 13.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Commercial  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	1

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 128.17  
9.3 Boiling Point at 1 atm: 289°F = 143°C = 416°K  
9.4 Freezing Point: -148°F = -100°C = 173°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.875 at 20°C (liquid)  
9.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 30 dynes/cm = 0.030 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: (est.) 120 Btu/lb = 69 cal/g =  $2.9 \times 10^5$  J/kg  
9.13 Heat of Combustion: (est.) -14,000 Btu/lb = -7,900 cal/g =  $-330 \times 10^5$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

NOTES

# ETHOXYDIHYDROPYRAN

EHP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	55.800	34	0.441	51	1.048	51	9.018
36	55.730	36	0.442	52	1.048	52	8.773
38	55.660	38	0.443	53	1.048	53	8.535
40	55.590	40	0.444	54	1.048	54	8.305
42	55.520	42	0.446	55	1.048	55	8.082
44	55.450	44	0.447	56	1.048	56	7.865
46	55.380	46	0.448	57	1.048	57	7.656
48	55.310	48	0.449	58	1.048	58	7.452
50	55.240	50	0.450	59	1.048	59	7.255
52	55.170	52	0.451	60	1.048	60	7.064
54	55.100	54	0.452	61	1.048	61	6.879
56	55.040	56	0.453	62	1.048	62	6.699
58	54.970	58	0.454	63	1.048	63	6.524
60	54.900	60	0.456	64	1.048	64	6.355
62	54.830	62	0.457	65	1.048	65	6.190
64	54.760	64	0.458	66	1.048	66	6.031
66	54.690	66	0.459	67	1.048	67	5.876
68	54.620	68	0.460	68	1.048	68	5.726
70	54.550	70	0.461			69	5.580
72	54.480	72	0.462			70	5.438
74	54.410	74	0.463			71	5.301
76	54.340	76	0.464			72	5.167
78	54.270	78	0.466			73	5.037
80	54.200	80	0.467			74	4.911
82	54.130	82	0.468			75	4.789
84	54.060	84	0.469			76	4.670

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.010	580	0.000	580	286.09998		N
		590	0.000	590	340.19998		O
		600	0.000	600	403.19998		T
		610	0.000	610	476.29999		
		620	0.000	620	560.79999		P
		630	0.000	630	658.29999		E
		640	0.000	640	770.50000		R
		650	0.000	650	899.09998		T
		660	0.000	660	1046.00000		I
		670	0.000	670	1214.00000		N
		680	0.000	680	1405.00000		E
		690	0.000	690	1622.00000		N
		700	0.000	700	1867.00000		T
		710	0.000	710	2145.00000		
		720	0.000	720	2457.00000		
		730	0.000	730	2809.00000		
		740	0.000	740	3203.00000		
		750	0.000	750	3645.00000		
		760	0.000	760	4138.00000		
		770	0.000	770	4688.00000		
		780	0.000	780	5300.00000		

# ETHYL HEXYL TALLATE

EHT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Croplas EH	Liquid	Light yellow	Mild odor
	Floats on water.		
Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide.		
<b>Exposure</b>	Not harmful.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula: (Mixture)  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Currently not available  
3.2 Symptoms Following Exposure: Currently not available  
3.3 Treatment of Exposure: Currently not available  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: None  
3.11 Liquid or Solid Characteristics: None  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 395°F O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Currently not available  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: (est.) 0.95 at 20°C (liquid)  
9.8 Liquid Surface Tension: 30.4 dynes/cm = 0.0304 N/m at 24°C  
9.9 Liquid Water Interfacial Tension: 28 dynes/cm = 0.028 N/m at 21.3°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -17,000 Btu/lb = -10,000 cal/g = -400 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: <1.0 psia

### NOTES

# ETHYL HEXYL TALLATE

EHT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
45	59.300	85	0.472	50	1.040	46	25.990
50	59.300	90	0.476	52	1.040	48	24.980
55	59.300	95	0.481	54	1.040	50	24.010
60	59.300	100	0.485	56	1.040	52	23.090
65	59.300	105	0.490	58	1.040	54	22.220
70	59.300	110	0.494	60	1.040	56	21.380
75	59.300	115	0.498	62	1.040	58	20.580
80	59.300	120	0.503	64	1.040	60	19.810
85	59.300	125	0.507	66	1.040	62	19.080
90	59.300	130	0.512	68	1.040	64	18.380
95	59.300	135	0.516	70	1.040	66	17.710
100	59.300	140	0.521	72	1.040	68	17.070
105	59.300	145	0.525	74	1.040	70	16.460
110	59.300	150	0.530	76	1.040	72	15.880
115	59.300			78	1.040	74	15.310
120	59.300			80	1.040	76	14.780
				82	1.040	78	14.260
				84	1.040	80	13.770
				86	1.040	82	13.300
				88	1.040	84	12.850
				90	1.040	86	12.410
				92	1.040	88	12.000
				94	1.040	90	11.600
				96	1.040	92	11.210
				98	1.040	94	10.850
				100	1.040	96	10.490

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T

# 2-ETHYL HEXANOL

EHX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Ethyl-1-hexanol 2-Ethylhexyl alcohol	Oily liquid Colorless Faint odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_5\text{CH}(\text{C}_2\text{H}_5)\text{CH}_2\text{OH}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 140-76-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51219

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Air pack or organic canister; goggles; rubber gloves.  
3.2 Symptoms Following Exposure: Anesthesia, nausea, headache, dizziness; mildly irritating to skin and eyes.  
3.3 Treatment of Exposure: INHALATION: move victim to fresh air. SKIN: wash affected areas with water. EYES: flush with water for 15 min. Get medical care.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5$  to  $5 \text{ g/kg}$  (lab animals)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Increased excitability of central nervous system in rats and rabbits.  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:  $185^\circ\text{F}$  O.C.  $175^\circ\text{F}$  C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature:  $581^\circ\text{F}$   
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate:  $4.0 \text{ mm/min}$ .  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio:  $57.1$  (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product):  $17.0$  (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  $19 \text{ ppm/24 hr/brine shrimp/TL}_m$   
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD):  $88\%$  of theoretical in 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99-99.7%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: C  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at  $15^\circ\text{C}$  and  $1 \text{ atm}$ : Liquid  
9.2 Molecular Weight: 130.23  
9.3 Boiling Point at  $1 \text{ atm}$ :  $364.5^\circ\text{F} = 184.7^\circ\text{C} = 457.9^\circ\text{K}$   
9.4 Freezing Point:  $<158^\circ\text{F} = <70^\circ\text{C} = <343^\circ\text{K}$   
9.5 Critical Temperature:  $710.6^\circ\text{F} = 377^\circ\text{C} = 650.2^\circ\text{K}$   
9.6 Critical Pressure:  $512 \text{ psia} = 34.8 \text{ atm} = 3.53 \text{ MN/m}^2$   
9.7 Specific Gravity:  $0.834$  at  $20^\circ\text{C}$  (liquid)  
9.8 Liquid Surface Tension:  $27.6 \text{ dynes/cm} = 0.0276 \text{ N/m}$  at  $20^\circ\text{C}$   
9.9 Liquid Water Interfacial Tension:  $22 \text{ dynes/cm} = 0.022 \text{ N/m}$  at  $22.7^\circ\text{C}$   
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization:  $167 \text{ Btu/lb} = 92.8 \text{ cal/g} = 3.89 \times 10^5 \text{ J/kg}$   
9.13 Heat of Combustion:  $-17,480 \text{ Btu/lb} = -9710 \text{ cal/g} = 406.5 \times 10^6 \text{ J/kg}$   
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure:  $0.01 \text{ psia}$

### NOTES

# 2-ETHYL HEXANOL

EHX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	52.970	35	0.514	34	0.927	52	14.180
40	52.830	40	0.521	36	0.927	54	13.530
45	52.690	45	0.527	38	0.927	56	12.920
50	52.550	50	0.534	40	0.927	58	12.330
55	52.410	55	0.541	42	0.927	60	11.780
60	52.260	60	0.547	44	0.927	62	11.260
65	52.120	65	0.554	46	0.927	64	10.760
70	51.980	70	0.561	48	0.927	66	10.290
75	51.840	75	0.567	50	0.927	68	9.843
80	51.690	80	0.574	52	0.927	70	9.418
85	51.550	85	0.581	54	0.927	72	9.015
90	51.410	90	0.587	56	0.927	74	8.632
95	51.270	95	0.594	58	0.927	76	8.268
100	51.130	100	0.601	60	0.927	78	7.922
105	50.980	105	0.607	62	0.927	80	7.592
110	50.840	110	0.614	64	0.927	82	7.279
115	50.700	115	0.621	66	0.927	84	6.980
120	50.560	120	0.627	68	0.927	86	6.696
125	50.410	125	0.634	70	0.927		
130	50.270	130	0.641	72	0.927		
135	50.130	135	0.647	74	0.927		
140	49.990	140	0.654	76	0.927		
145	49.850	145	0.661	78	0.927		
150	49.700	150	0.667	80	0.927		
155	49.560	155	0.674	82	0.927		
160	49.420			84	0.927		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.070	60	0.002	60	0.00006		N
		70	0.004	70	0.00009		O
		80	0.006	80	0.00013		T
		90	0.009	90	0.00020		
		100	0.014	100	0.00030		P
		110	0.020	110	0.00044		E
		120	0.030	120	0.00063		R
		130	0.043	130	0.00089		T
		140	0.062	140	0.00125		I
		150	0.088	150	0.00174		N
		160	0.122	160	0.00240		E
		170	0.169	170	0.00326		N
		180	0.232	180	0.00439		T
		190	0.314	190	0.00586		
		200	0.422	200	0.00775		
		210	0.561	210	0.01017		
		220	0.741	220	0.01322		
		230	0.970	230	0.01707		
		240	1.261	240	0.02186		
		250	1.626	250	0.02780		
		260	2.083	260	0.03511		
		270	2.649	270	0.04405		
		280	3.348	280	0.05492		
		290	4.205	290	0.06806		
		300	5.250	300	0.08385		

# ETHYL LACTATE

ELT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethyl dl-lactate Ethyl 2-hydroxypropanoate Ethyl 2-hydroxypropionate Ethyl alpha-hydroxypropionate Lactic acid, ethyl ester	Liquid	Colorless	Mild odor
Mixes with water.			
Keep people away. Avoid inhalation. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.		
<b>Exposure</b>	Call for medical aid.  LIQUID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula: CH<sub>3</sub>CHOHCOOC<sub>2</sub>H<sub>5</sub>  
 2.3 IMO/UN Designation: 3.3/1192  
 2.4 DOT ID No.: 1192  
 2.5 CAS Registry No.: 97-64-3  
 2.6 NAERG Guide No.: 129  
 2.7 Standard Industrial Trade Classification: 51391

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves.  
 3.2 Symptoms Following Exposure: Inhalation of concentrated vapor may cause drowsiness. Contact with liquid causes mild irritation of eyes and (on prolonged contact) skin. Ingestion may cause narcosis.  
 3.3 Treatment of Exposure: INHALATION: remove victim to fresh air. EYES and SKIN: flush well with water. INGESTION: induce vomiting; get medical attention.  
 3.4 TLV-TWA: Not listed.  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 Toxicity by Ingestion: Grade 2; oral LD<sub>50</sub> = 2,580 mg/kg (mouse)  
 3.8 Toxicity by Inhalation: Currently not available.  
 3.9 Chronic Toxicity: Currently not available  
 3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
 3.11 Liquid or Solid Characteristics: Currently not available  
 3.12 Odor Threshold: Currently not available  
 3.13 IDLH Value: Not listed.  
 3.14 OSHA PEL-TWA: Not listed.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 158°F O.C. 115°F C.C.  
 4.2 Flammable Limits in Air: 1.5%-11.4%  
 4.3 Fire Extinguishing Agents: Water, dry chemical, alcohol foam, carbon dioxide  
 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
 4.5 Special Hazards of Combustion Products: Not pertinent  
 4.6 Behavior in Fire: Not pertinent  
 4.7 Auto Ignition Temperature: 752°F  
 4.8 Electrical Hazards: Currently not available  
 4.9 Burning Rate: Currently not available  
 4.10 Adiabatic Flame Temperature: Currently not available  
 4.11 Stoichiometric Air to Fuel Ratio: 28.6 (calc.)  
 4.12 Flame Temperature: Currently not available  
 4.13 Combustion Molar Ratio (Reactant to Product): 10.0 (calc.)  
 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
 5.2 Reactivity with Common Materials: No reaction  
 5.3 Stability During Transport: Stable  
 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
 5.5 Polymerization: Not pertinent  
 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
 6.2 Waterfowl Toxicity: Currently not available  
 6.3 Biological Oxygen Demand (BOD): Currently not available  
 6.4 Food Chain Concentration Potential: None  
 6.5 GESAMP Hazard Profile:  
 Bioaccumulation: 0  
 Damage to living resources: (1)/B  
 Human Oral hazard: 1  
 Human Contact hazard: 0  
 Reduction of amenities: 0

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Commercial  
 7.2 Storage Temperature: Ambient  
 7.3 Inert Atmosphere: No requirement  
 7.4 Venting: Open (flame arrester)  
 7.5 IMO Pollution Category: Currently not available  
 7.6 Ship Type: Currently not available  
 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid  
 8.2 49 CFR Class: 3  
 8.3 49 CFR Package Group: III  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
 9.2 Molecular Weight: 118.1  
 9.3 Boiling Point at 1 atm: 309°F = 154°C = 427°K  
 9.4 Freezing Point: Not pertinent  
 9.5 Critical Temperature: Not pertinent  
 9.6 Critical Pressure: Not pertinent  
 9.7 Specific Gravity: 1.03 at 20°C (liquid)  
 9.8 Liquid Surface Tension: 29.20 dynes/cm = 0.0292 N/m at 20°C  
 9.9 Liquid Water Interfacial Tension: Not pertinent  
 9.10 Vapor (Gas) Specific Gravity: Not pertinent  
 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
 9.12 Latent Heat of Vaporization: Not pertinent  
 9.13 Heat of Combustion: (est.) -11,600 Btu/lb = -6,500 cal/g = -270 X 10<sup>3</sup> J/kg  
 9.14 Heat of Decomposition: Not pertinent  
 9.15 Heat of Solution: Currently not available  
 9.16 Heat of Polymerization: Not pertinent  
 9.17 Heat of Fusion: Currently not available  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: Currently not available

### NOTES



# ETHYL LACTATE

ELT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	65.549	52	0.441	51	1.048	51	9.018
40	65.360	54	0.442	52	1.048	52	8.773
45	65.169	56	0.443	53	1.048	53	8.535
50	64.980	58	0.444	54	1.048	54	8.305
55	64.790	60	0.446	55	1.048	55	8.082
60	64.599	62	0.447	56	1.048	56	7.865
65	64.410	64	0.448	57	1.048	57	7.656
70	64.219	66	0.449	58	1.048	58	7.452
75	64.030	68	0.450	59	1.048	59	7.255
80	63.840	70	0.451	60	1.048	60	7.064
85	63.650	72	0.452	61	1.048	61	6.879
90	63.460	74	0.453	62	1.048	62	6.699
95	63.260	76	0.454	63	1.048	63	6.524
100	63.070	78	0.456	64	1.048	64	6.355
105	62.880	80	0.457	65	1.048	65	6.190
110	62.690	82	0.458	66	1.048	66	6.031
115	62.500	84	0.459	67	1.048	67	5.876
120	62.310	86	0.460	68	1.048	68	5.726
125	62.120	88	0.461	69	1.048	69	5.580
130	61.930	90	0.462	70	1.048	70	5.438
135	61.740	92	0.463	71	1.048	71	5.301
140	61.550	94	0.464	72	1.048	72	5.167
145	61.360	96	0.466	73	1.048	73	5.037
150	61.170	98	0.467	74	1.048	74	4.911
155	60.980	100	0.468	75	1.048	75	4.789
		102	0.469	76	1.048	76	4.670

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	268	7.681	268	0.11610		N
	I	270	7.941	270	0.11970		O
	S	272	8.209	272	0.12340		T
	C	274	8.483	274	0.12720		
	I	276	8.766	276	0.13110		P
	B	278	9.056	278	0.13510		E
	L	280	9.354	280	0.13910		R
	E	282	9.660	282	0.14330		T
		284	9.974	284	0.14760		I
		286	10.300	286	0.15190		N
		288	10.630	288	0.15640		E
		290	10.970	290	0.16100		N
		292	11.320	292	0.16570		T
		294	11.680	294	0.17050		
		296	12.050	296	0.17540		
		298	12.420	298	0.18040		
		300	12.810	300	0.18550		
		302	13.210	302	0.19080		
		304	13.610	304	0.19610		
		306	14.030	306	0.20160		
		308	14.460	308	0.20720		
		310	14.900	310	0.21300		
		312	15.350	312	0.21880		
		314	15.810	314	0.22480		
		316	16.280	316	0.23090		
		318	16.770	318	0.23720		

# ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE

EMA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Butoxyethanol acetate 2-Butoxyethyl acetate Butyl "cellosolve" acetate Glycol monobutyl ether acetate	Liquid  Colorless  Weak fruity odor  Floats and mixes slowly with water.
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $n\text{-C}_4\text{H}_9\text{OCH}_2\text{CH}_2\text{OCOCH}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 112-07-2  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Inhalation of concentrated vapor may cause headache, nausea, dizziness. Liquid causes irritation of eyes and mild irritation of skin. Ingestion produces same symptoms as inhalation.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air. EYES: flush thoroughly with water for at least 15 min. SKIN: flush thoroughly with water. INGESTION: induce vomiting; get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50}$  = 3,200 mg/kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 190°F O.C. 160°F C.C.  
4.2 **Flammable Limits in Air:** 0.9%-8.5%  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 645°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 4.1 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 98+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 160.21  
9.3 **Boiling Point at 1 atm:** 378.0°F = 192.2°C = 465.4°K  
9.4 **Freezing Point:** -82.3°F = -63.5°C = 209.7°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.942 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 120 Btu/lb = 65 cal/g =  $2.7 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** (est.) 14,000 Btu/lb = -7,700 cal/g =  $-320 \times 10^3$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE

EMA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	59.980	52	0.441	52	1.048	52	2.135
36	59.910	54	0.442	54	1.048	54	2.089
38	59.840	56	0.443	56	1.048	56	2.044
40	59.770	58	0.444	58	1.048	58	2.000
42	59.700	60	0.446	60	1.048	60	1.958
44	59.630	62	0.447	62	1.048	62	1.917
46	59.560	64	0.448	64	1.048	64	1.877
48	59.500	66	0.449	66	1.048	66	1.838
50	59.430	68	0.450	68	1.048	68	1.800
52	59.360	70	0.451	70	1.048	70	1.764
54	59.290	72	0.452	72	1.048	72	1.728
56	59.220	74	0.453	74	1.048	74	1.693
58	59.150	76	0.454	76	1.048	76	1.659
60	59.080	78	0.456	78	1.048	78	1.627
62	59.010	80	0.457	80	1.048	80	1.595
64	58.940	82	0.458	82	1.048	82	1.563
66	58.870	84	0.459	84	1.048	84	1.533
68	58.800	86	0.460	86	1.048	86	1.504
70	58.730						
72	58.660						
74	58.590						
76	58.520						
78	58.450						
80	58.390						
82	58.320						
84	58.250						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	1.420	180	0.126	180	0.00293		N
36	1.440	190	0.171	190	0.00393		O
38	1.460	200	0.231	200	0.00523		T
40	1.480	210	0.309	210	0.00689		
42	1.500	220	0.410	220	0.00901		P
44	1.520	230	0.540	230	0.01168		E
46	1.540	240	0.705	240	0.01503		R
48	1.560	250	0.913	250	0.01920		T
50	1.580	260	1.174	260	0.02435		I
52	1.600	270	1.500	270	0.03068		N
54	1.620	280	1.904	280	0.03841		E
56	1.640	290	2.400	290	0.04779		N
58	1.660	300	3.008	300	0.05910		T
60	1.680	310	3.748	310	0.07268		
62	1.700	320	4.644	320	0.08889		
64	1.720	330	5.722	330	0.10820		
66	1.740	340	7.015	340	0.13090		
68	1.760	350	8.555	350	0.15770		
70	1.780	360	10.380	360	0.18910		
72	1.800	370	12.550	370	0.22570		
74	1.820	380	15.090	380	0.26820		
76	1.840	390	18.070	390	0.31740		
78	1.860						
80	1.880						
82	1.900						
84	1.920						

# ETHYL MERCAPTAN

EMC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethanethiol Ethyl sulphydrate Mercaptoethane Thioethyl alcohol	Liquid  Colorless to yellow  Strong skunk-like odor  Floats and mixes slowly with water. Poisonous, flammable vapor is produced. Boiling point is 95°F.
<b>Evacuate.</b> <b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear goggles and self-contained breathing apparatus. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Collection Systems: Skim Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>2</sub> H <sub>5</sub> SH 2.3 IMO/UN Designation: 3.1/1228 2.4 DOT ID No.: 2363 2.5 CAS Registry No.: 75-08-1 2.6 NAERG Guide No.: 130 2.7 Standard Industrial Trade Classification: 51549
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Plastic gloves; goggles or face shield. 3.2 <b>Symptoms Following Exposure:</b> Inhalation of vapor causes muscular weakness, convulsions, respiratory paralysis. High concentrations may cause pulmonary irritation. Liquid irritates eyes and skin. Ingestion causes nausea and irritation of mouth and stomach. 3.3 <b>Treatment of Exposure:</b> INHALATION: move victim to fresh air; if he is unconscious, give artificial respiration and oxygen; get medical attention. EYES: flush with water for at least 15 min. following contact with liquid; get medical attention if irritation persists. SKIN: wash well with water. INGESTION: induce vomiting and follow with gastric lavage; get medical attention. 3.4 TLV-TWA: 0.5 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; oral LD <sub>50</sub> = 682 mg/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> May impair respiratory muscle function in warm-blooded experimental animals 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> 0.001 ppm 3.13 <b>IDLH Value:</b> 500 ppm 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> 10 ppm 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** <0°F O.C.  
4.2 **Flammable Limits in Air:** 2.8%-18%  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Irritating fumes of sulfur dioxide are generated.  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel long distance to a source of ignition and flash back; containers may explode in a fire; offensive fumes are released when heated.  
4.7 **Auto Ignition Temperature:** 572°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 5.7 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: (T)  
Damage to living resources: 4  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98.5+%  
7.2 **Storage Temperature:** Below 30°C  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 62.1  
9.3 **Boiling Point at 1 atm:** 93.9°F = 34.4°C = 307.6°K  
9.4 **Freezing Point:** -234°F = -147°C = 126°K  
9.5 **Critical Temperature:** 438.8°F = 226°C = 499.2°K  
9.6 **Critical Pressure:** 798 psia = 54.2 atm = 5.50 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.826 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 23.5 dynes/cm = 0.0235 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 25 dynes/cm = 0.025 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 2.1  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1308 at 16°C  
9.12 **Latent Heat of Vaporization:** 189 Btu/lb = 105 cal/g = 4.39 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -15,000 Btu/lb = -8,300 cal/g = -350 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 19.14 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# ETHYL MERCAPTAN

EMC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	54.390	0	0.439	15	1.037	-35	0.340
10	53.970	10	0.441	20	1.026	-30	0.332
20	53.560	20	0.443	25	1.015	-25	0.324
30	53.140	30	0.446	30	1.004	-20	0.316
40	52.730	40	0.448	35	0.993	-15	0.309
50	52.310	50	0.450	40	0.982	-10	0.302
60	51.890	60	0.452	45	0.971	-5	0.295
70	51.480	70	0.454	50	0.960	0	0.288
80	51.061	80	0.456	55	0.949	5	0.282
90	50.650	90	0.458	60	0.938	10	0.276
				65	0.927	15	0.271
				70	0.916	20	0.265
				75	0.905	25	0.260
				80	0.894	30	0.255
				85	0.883	35	0.250
				90	0.872	40	0.246
						45	0.241
						50	0.237
						55	0.233
						60	0.229
						65	0.225
						70	0.222
						75	0.218
						80	0.215
						85	0.211
						90	0.208

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.500	15	2.360	15	0.02876	0	0.261
		20	2.696	20	0.03251	25	0.268
		25	3.071	25	0.03665	50	0.275
		30	3.489	30	0.04122	75	0.282
		35	3.954	35	0.04625	100	0.290
		40	4.470	40	0.05176	125	0.297
		45	5.041	45	0.05779	150	0.304
		50	5.672	50	0.06438	175	0.311
		55	6.366	55	0.07156	200	0.318
		60	7.130	60	0.07938	225	0.326
		65	7.969	65	0.08786	250	0.333
		70	8.887	70	0.09706	275	0.340
		75	9.891	75	0.10700	300	0.347
		80	10.990	80	0.11780	325	0.354
		85	12.180	85	0.12940	350	0.361
		90	13.480	90	0.14180	375	0.369
		95	14.890	95	0.15520	400	0.376
		100	16.410	100	0.16960	425	0.383
						450	0.390
						475	0.397
						500	0.404
						525	0.412
						550	0.419
						575	0.426
						600	0.433

# ETHYLENE GLYCOL MONOMETHYL ETHER

EME

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dowanol EM Glycol monomethyl ether 2-Methoxyethanol Methyl cellosolve Poly-solv EM	Liquid                      Colorless                      Odorless  Floats and mixes with water.
<p>Call fire department.  Avoid contact with liquid.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 40; Glycol ether  
2.2 Formula: CH<sub>3</sub>OCH<sub>2</sub>CH<sub>2</sub>OH  
2.3 IMO/UN Designation: 3.3/1188  
2.4 DOT ID No.: 1188  
2.5 CAS Registry No.: 109-86-4  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Chemical safety goggles; protective clothing; supplied-air respirator for high concentrations; safety shower and eye bath.  
3.2 **Symptoms Following Exposure:** Irritation of skin and eyes. Chronic exposure may also cause weakness, sleepiness, headache, gastrointestinal upset, weight loss, change of personality.  
3.3 **Treatment of Exposure:** SKIN OR EYES: wash affected area with water for 15 min.  
3.4 TLV-TWA: 5 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5g/kg (rat, rabbit, guinea pig)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Causes blood disorders and damage to central nervous system in humans.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.9 ppm  
3.13 **IDLH Value:** 200 ppm  
3.14 **OSHA PEL-TWA:** 25 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 120°F O.C. 107°F C.C.  
4.2 **Flammable Limits in Air:** 2.5%-19.8%  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide or alcohol foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 551°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 1.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 19.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 15% (theor.), 1-10 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 76.10  
9.3 **Boiling Point at 1 atm:** 256.1°F = 124.5°C = 397.7°K  
9.4 **Freezing Point:** -121.2°F = -85.1°C = 188.1°K  
9.5 **Critical Temperature:** 557.6°F = 292°C = 565.2°K  
9.6 **Critical Pressure:** 735 psia = 50 atm = 5.1 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.966 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 33 dynes/cm = 0.033 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.079  
9.12 **Latent Heat of Vaporization:** 223 Btu/lb = 124 cal/g = 5.19 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -9460 Btu/lb = -5250 cal/g = -220 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.39 psia

### NOTES

# ETHYLENE GLYCOL MONOMETHYL ETHER

EME

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	61.220	35	0.552	85	1.298		N O T  P E R T I N E N T
50	60.890	40	0.554	90	1.291		
60	60.560	45	0.557	95	1.283		
70	60.230	50	0.560	100	1.276		
80	59.900	55	0.563	105	1.268		
90	59.580	60	0.565	110	1.260		
100	59.250	65	0.568	115	1.253		
110	58.920	70	0.571	120	1.245		
120	58.590	75	0.574	125	1.238		
130	58.260	80	0.577	130	1.230		
140	57.930	85	0.579	135	1.223		
150	57.600	90	0.582	140	1.215		
160	57.270	95	0.585	145	1.207		
170	56.940	100	0.588	150	1.200		
180	56.610						
190	56.280						
200	55.950						
210	55.620						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		60	0.088	60	0.00120	0	0.332
		70	0.129	70	0.00173	25	0.341
		80	0.186	80	0.00245	50	0.350
		90	0.264	90	0.00341	75	0.359
		100	0.368	100	0.00467	100	0.368
		110	0.506	110	0.00630	125	0.377
		120	0.685	120	0.00837	150	0.385
		130	0.914	130	0.01099	175	0.394
		140	1.205	140	0.01424	200	0.402
		150	1.570	150	0.01825	225	0.411
		160	2.022	160	0.02314	250	0.419
		170	2.579	170	0.02903	275	0.427
		180	3.256	180	0.03609	300	0.435
		190	4.074	190	0.04445	325	0.443
		200	5.053	200	0.05430	350	0.451
		210	6.216	210	0.06581	375	0.458
		220	7.589	220	0.07915	400	0.466
		230	9.197	230	0.09453	425	0.474
		240	11.070	240	0.11220	450	0.481
		250	13.240	250	0.13220	475	0.488
		260	15.730	260	0.15490	500	0.495
		270	18.580	270	0.18050	525	0.502
		280	21.830	280	0.20920	550	0.509
		290	25.510	290	0.24120	575	0.516
		300	29.660	300	0.27680	600	0.523

# N-ETHYL MORPHOLINE

EMN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 4-Ethylmorpholine	Liquid	Colorless to slight yellow	Ammonia-like
<b>Wear impervious protective clothing and approved respirator.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Flammable. Toxic gases, such as ammonia and nitrogen oxides, may be produced. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with alcohol foam, carbon dioxide, or dry chemical.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. If swallowed, and victim is conscious, give large quantities of water and induce vomiting.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>4</sub>H<sub>9</sub>ON(C<sub>2</sub>H<sub>5</sub>)  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 100-74-3  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51579

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Impervious protective clothing and gloves, full face shield; approved respirator.  
3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat. Contact with eyes may result in foggy vision and seeing halos around lights.  
3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. EYES: Flush with water for at least 15 min., lifting lids occasionally. Contact lenses should not be worn when working with this chemical. SKIN: Flush with water. INGESTION: If the victim is conscious, give large quantity of water immediately, then induce vomiting.  
3.4 TLV-TWA: 5 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 1.78 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Vapor causes visual disturbances and irritates mucous membranes. There is a possibility that eye damage could be permanent.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 25 ppm  
3.13 IDLH Value: 100 ppm  
3.14 OSHA PEL-TWA: 20 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 90°F C.C.  
4.2 **Flammable Limits in Air:** LEL: 1.0%; UEL: 9.8%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, carbon dioxide, dry chemical.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as ammonia, nitrogen oxides, and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Can react vigorously with heat or flame.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Will attack some forms of plastics, rubber, and coatings (insulators).  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 46.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Oxidizing materials can cause a vigorous reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%; technical.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 115.2  
9.3 **Boiling Point at 1 atm:** 281°F = 138.6°C = 411.6°K  
9.4 **Freezing Point:** -81°F = -63°C = 210°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.916 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.0  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# N-ETHYL MORPHOLINE

EMN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	7.640		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	68	0.097	68	0.00197		C U R R E N T L Y  N O T  A V A I L A B L E

# ETHYLENEDIAMINE

EDA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Diaminoethane 1,2-Ethanediamine Ethylenediamine (Dow) Ethyleneamine 1302)	Liquid                      Colorless                      Mild ammonia odor  Floats and mixes with water. Irritating vapor is produced. Freezing point is 52°F.
Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amine
- 2.2 Formula:  $\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$
- 2.3 IMO/UN Designation: 8.0/1604
- 2.4 DOT ID No.: 1604
- 2.5 CAS Registry No.: 107-15-3
- 2.6 NAERG Guide No.: 132
- 2.7 Standard Industrial Trade Classification: 51452

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full rubber protective clothing, incl. gloves and boots; chemical worker's goggles; face shield where contact with face is likely. If necessary to enter closed area for 1/2 hr or less with mist, wear full-faced gas mask with canister approved by Bureau of Standards for use with ammonia.
- 3.2 **Symptoms Following Exposure:** High concentration of vapor burns eyes and irritates nose and throat. Liquid burns eyes and skin.
- 3.3 **Treatment of Exposure:** Get medical help immediately] INGESTION: drink large amounts of water or milk quickly, induce vomiting only if instructed by physician. EYES: flush immediately and thoroughly with flowing water for at least 15 min. SKIN: remove clothing and flush affected area with copious amounts of flowing water, then wash with soap and water; severe exposure may require showering.
- 3.4 **TLV-TWA:** 10 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (female rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second- degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** 10 ppm
- 3.13 **IDLH Value:** 1,000 ppm
- 3.14 **OSHA PEL-TWA:** 10 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 99°F O.C. 150°F C.C.
- 4.2 **Flammable Limits in Air:** 5.8%–11.1%
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemicals, foam or water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water in case of drum or tank fires.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 715°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 2.2 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Gives off heat, but reaction is not hazardous.
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 60 ppm/24 hr/chub/killed/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 75% (theor.), 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 60.10
- 9.3 **Boiling Point at 1 atm:** 243°F = 117°C = 390°K
- 9.4 **Freezing Point:** 51.8°F = 11.0°C = 284.2°K
- 9.5 **Critical Temperature:** 608.0°F = 320°C = 593.2°K
- 9.6 **Critical Pressure:** 941 psia = 64 atm = 6.4 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.909 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.087
- 9.12 **Latent Heat of Vaporization:** 288 Btu/lb = 160 cal/g = 6.70 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** –12,290 Btu/lb = –6830 cal/g = –286.0 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) –9 Btu/lb = –5 cal/g = –0.2 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.6 psia

### NOTES

# ETHYLENEDIAMINE

EDA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	57.000	60	0.689		N		N
70	56.650	70	0.694		O		O
80	56.290	80	0.698		T		T
90	55.940	90	0.703				
100	55.590	100	0.707		P		P
110	55.230	110	0.712		E		E
120	54.880	120	0.716		R		R
130	54.520	130	0.720		T		T
140	54.170	140	0.725		I		I
150	53.820	150	0.729		N		N
160	53.460	160	0.734		E		E
170	53.110	170	0.738		N		N
180	52.760	180	0.743		T		T
190	52.400	190	0.747				
200	52.050	200	0.752				
210	51.690	210	0.756				
		220	0.760				
		230	0.765				
		240	0.769				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	60	0.151	60	0.00162	0	0.381
	I	70	0.216	70	0.00228	25	0.392
	S	80	0.304	80	0.00315	50	0.404
	C	90	0.420	90	0.00428	75	0.415
	I	100	0.573	100	0.00573	100	0.426
	B	110	0.771	110	0.00757	125	0.437
	L	120	1.023	120	0.00988	150	0.448
	E	130	1.340	130	0.01273	175	0.459
		140	1.737	140	0.01621	200	0.470
		150	2.226	150	0.02044	225	0.480
		160	2.824	160	0.02552	250	0.491
		170	3.550	170	0.03156	275	0.501
		180	4.422	180	0.03870	300	0.511
		190	5.461	190	0.04706	325	0.521
		200	6.692	200	0.05679	350	0.531
		210	8.138	210	0.06804	375	0.540
		220	9.827	220	0.08095	400	0.550
		230	11.790	230	0.09568	425	0.559
		240	14.050	240	0.11240	450	0.569
		250	16.640	250	0.13130	475	0.578
		260	19.600	260	0.15250	500	0.587
		270	22.950	270	0.17610	525	0.595
		280	26.750	280	0.20250	550	0.604
		290	31.020	290	0.23160	575	0.613
		300	35.800	300	0.26380	600	0.621

# ETHYLIDENE NORBORNENE

ENB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 5-Ethylidenebicyclo (2, 2, 1)hept-2-ene Ethylidenenorbornylene Ethylidenenorbornene	Liquid  White  Turpentine-like odor  Floats on water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_8H_{12}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 16219-75-3  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister or air-supplied mask; goggles or face shield; rubber gloves
- 3.2 **Symptoms Following Exposure:** Inhalation of vapors causes headache, confusion, and respiratory distress. Ingestion causes irritation of entire digestive system. Aspiration causes severe pneumonia. Contact with liquid causes irritation of eyes and skin.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: give large amount of water and induce vomiting; get medical attention at once. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 5 ppm  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $LD_{50} = 2.83$  g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Causes kidney lesions and gain in kidney and liver weights in rats  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** 0.007 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 98°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 120.2  
9.3 **Boiling Point at 1 atm:** 297.7°F = 147.6°C = 420.8°K  
9.4 **Freezing Point:** -112°F = -80°C = 193°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.896 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.1  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** (est.) -18,000 Btu/lb = -10,450 cal/g = -437 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.23 psia

### NOTES

# ETHYLIDENE NORBORNENE

ENB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	56.490	N O T  P E R T I N E N T		52	1.048		N O T  P E R T I N E N T
54	56.420			54	1.048		
56	56.350			56	1.048		
58	56.280			58	1.048		
60	56.210			60	1.048		
62	56.140			62	1.048		
64	56.070			64	1.048		
66	56.000			66	1.048		
68	55.930			68	1.048		
70	55.860			70	1.048		
72	55.790			72	1.048		
74	55.720			74	1.048		
76	55.650			76	1.048		
78	55.580			78	1.048		
80	55.510			80	1.048		
82	55.440			82	1.048		
84	55.380			84	1.048		
86	55.310			86	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.010	60	0.062	60	0.00134		N O T  P E R T I N E N T
		70	0.087	70	0.00183		
		80	0.119	80	0.00247		
		90	0.161	90	0.00328		
		100	0.216	100	0.00433		
		110	0.287	110	0.00564		
		120	0.377	120	0.00729		
		130	0.492	130	0.00934		
		140	0.635	140	0.01185		
		150	0.813	150	0.01493		
		160	1.032	160	0.01866		
		170	1.301	170	0.02314		
		180	1.629	180	0.02851		
		190	2.024	190	0.03489		
		200	2.499	200	0.04242		
		210	3.067	210	0.05127		
		220	3.740	220	0.06161		
		230	4.535	230	0.07363		
		240	5.468	240	0.08752		
		250	6.560	250	0.10350		
		260	7.829	260	0.12180		
		270	9.298	270	0.14270		
		280	10.990	280	0.16640		
		290	12.940	290	0.19320		
		300	15.160	300	0.22350		

# ETHOXYLATED NONYLPHENOL

ENP

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid or solid	White	Mild odor
	May float or sink in water.		
Keep people away. Avoid contact with liquid and solid. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
Fire	Combustible. Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
Exposure	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{18}H_{34}O(C_2H_4O)_n$  where  $n = 4 - 100$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51243

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Gloves and safety glasses  
3.2 Symptoms Following Exposure: Contact with eyes causes irritation. Prolonged contact with skin causes irritation.  
3.3 Treatment of Exposure: No treatment required for inhalation or ingestion. EYES: flush with copious quantities of tap water for 15 min. and seek appropriate medical attention. SKIN: wash affected areas with soap and water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; oral  $LD_{50} = 1,310$  mg/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: (burns with difficulty) 338-600°F O.C.; > 140°F C.C.  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Dry chemicals, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective on fire.  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 1.3 to > 1,000 ppm/96 hr/bluegills/LC<sub>50</sub> (increased ethyleneoxide chain length gives decreased toxicity)  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 0.5-2.0% of theoretical in 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid or liquid  
9.2 Molecular Weight: >500  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.99-1.07 at 25°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ETHOXYLATED NONYLPHENOL

ENP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ETHOXYLATED DODECANOL

EOD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethoxylated dodecyl alcohol Ethoxylated lauryl alcohol Poly (oxyethyl) dodecyl ether Poly (oxyethyl) lauryl ether Tergitol nonionic TMN	Oily liquid  Colorless to yellow  Pleasant odor  Mixes slowly with water. Freezing point is 61°F.
Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with water, foam, dry chemical, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin. Will burn eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 20; Alcohol, glycol  
2.2 **Formula:** C<sub>12</sub>H<sub>25</sub>O(CH<sub>2</sub>CH<sub>2</sub>O)<sub>n</sub>CH<sub>2</sub>CH<sub>2</sub>OH where n = 6-10 (average)  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Plastic gloves, goggles.  
3.2 **Symptoms Following Exposure:** Liquid causes eye injury and de-fats the skin, causing irritation.  
3.3 **Treatment of Exposure:** Flush eyes with water for at least 15 min. Wash skin well with water. Get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5-15 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** None  
3.11 **Liquid or Solid Characteristics:** Liquid causes eye injury. Contact with skin may cause irritation.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 470°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Usually 100%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 450-626  
9.3 **Boiling Point at 1 atm:** Very high  
9.4 **Freezing Point:** 61°F = 16°C = 289°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.02 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -11,00 Btu/lb = -6,200 cal/g = -260 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ETHOXYLATED DODECANOL

EOD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
61	63.290	68	0.478		N		N
62	63.260	69	0.478		O		O
63	63.220	70	0.478		T		T
64	63.190	71	0.478				
65	63.150	72	0.478		P		P
66	63.120	73	0.478		E		E
67	63.080	74	0.478		R		R
68	63.050	75	0.478		T		T
69	63.010	76	0.478		I		I
70	62.980	77	0.478		N		N
71	62.940	78	0.478		E		E
72	62.910	79	0.478		N		N
73	62.870	80	0.478		T		T
74	62.840	81	0.478				
75	62.800	82	0.478				
76	62.770	83	0.478				
77	62.730	84	0.478				
78	62.700	85	0.478				
79	62.670						
80	62.630						
81	62.600						
82	62.560						
83	62.530						
84	62.490						
85	62.460						
86	62.420						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	10.000		N		N		N
			O		O		O
			T		T		T
			P		P		P
			E		E		E
			R		R		R
			T		T		T
			I		I		I
			N		N		N
			E		E		E
			N		N		N
			T		T		T

# ETHOXYLATED PENTADECANOL

EOP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethoxylated pentadecylalcohol Poly(oxyethyl) pentadecyl ether Tergitol nonionic 45-S-10		Liquid	Colorless to yellow	Pleasant odor
		Mixes slowly with water. Freezing point is 59°F.		
Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin. Will burn eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 20; Alcohol, glycol  
2.2 **Formula:**  $C_{15}H_{31}O(CH_2CH_2O)_nCH_2CH_2OH$   
where n = 10 (average)  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Plastic gloves, goggles  
3.2 **Symptoms Following Exposure:** Liquid causes eye injury and de-fats the skin, causing irritation.  
3.3 **Treatment of Exposure:** Flush eyes with water for at least 15 min. Wash skin well with water. Get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** None  
3.11 **Liquid or Solid Characteristics:** Liquid causes eye injury. Contact with skin may cause irritation.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 470°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; alcohol foam and water for large fires  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Usually 100%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 660  
9.3 **Boiling Point at 1 atm:** Very high  
9.4 **Freezing Point:** 59°F = 15°C = 288°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.007 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) = -11,000 Btu/lb = -6,200 cal/g = -260 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHOXYLATED PENTADECANOL

EOP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	62.700	68	0.478		N		N
61	62.670	69	0.478		O		O
62	62.630	70	0.478		T		T
63	62.600	71	0.478				
64	62.560	72	0.478		P		P
65	62.530	73	0.478		E		E
66	62.490	74	0.478		R		R
67	62.460	75	0.478		T		T
68	62.420	76	0.478		I		I
69	62.390	77	0.478		N		N
70	62.350	78	0.478		E		E
71	62.320	79	0.478		N		N
72	62.280	80	0.478		T		T
73	62.250	81	0.478				
74	62.210	82	0.478				
75	62.180	83	0.478				
76	62.150	84	0.478				
77	62.110	85	0.478				
78	62.080						
79	62.040						
80	62.010						
81	61.970						
82	61.940						
83	61.900						
84	61.870						
85	61.830						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	10.000		N		N		N
			O		O		O
			T		T		T
			P		P		P
			E		E		E
			R		R		R
			T		T		T
			I		I		I
			N		N		N
			E		E		E
			N		N		N
			T		T		T

# ETHOXYLATED TETRADECANOL

EOT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethoxylated myristyl alcohol Ethoxylated tetradecyl alcohol Poly(oxyethyl) myristyl ether Poly(oxyethyl) tetradecyl ether Tergitol nonionic 45-S-10		Liquid  Colorless to yellow  Pleasant odor  Mixes slowly with water. Freezing point is 59°F.
Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin. Will burn eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 20; Alcohol, glycol
- 2.2 **Formula:**  $C_{14}H_{32}O(CH_2CH_2O)_nCH_2CH_2OH$  where  $n = 10$  (average)
- 2.3 **IMO/UN Designation:** Not listed
- 2.4 **DOT ID No.:** Not listed
- 2.5 **CAS Registry No.:** Currently not available
- 2.6 **NAERG Guide No.:** Not listed
- 2.7 **Standard Industrial Trade Classification:** 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Plastic gloves; goggles.
- 3.2 **Symptoms Following Exposure:** Liquid causes eye injury and de-fats the skin, causing irritation.
- 3.3 **Treatment of Exposure:** Flush eyes with water for at least 15 min. Wash skin well with water. Get medical attention.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** None
- 3.11 **Liquid or Solid Characteristics:** Liquid causes eye injury. Contact with skin may cause irritation.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 470°F O.C.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; alcohol foam and water for large fires.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Usually 100%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 660
- 9.3 **Boiling Point at 1 atm:** Very high
- 9.4 **Freezing Point:** 59°F = 15°C = 288°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.007 at 15°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -11,000 Btu/lb = -6,200 cal/g = -260 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>3</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHOXYLATED TETRADECANOL

EOT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	62.700	68	0.478		N		N
61	62.670	69	0.478		O		O
62	62.630	70	0.478		T		T
63	62.600	71	0.478				
64	62.560	72	0.478		P		P
65	62.530	73	0.478		E		E
66	62.490	74	0.478		R		R
67	62.460	75	0.478		T		T
68	62.420	76	0.478		I		I
69	62.390	77	0.478		N		N
70	62.350	78	0.478		E		E
71	62.320	79	0.478		N		N
72	62.280	80	0.478		T		T
73	62.250	81	0.478				
74	62.210	82	0.478				
75	62.180	83	0.478				
76	62.150	84	0.478				
77	62.110	85	0.478				
78	62.080						
79	62.040						
80	62.010						
81	61.970						
82	61.940						
83	61.900						
84	61.870						
85	61.830						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	10.000		N		N		N
			O		O		O
			T		T		T
			P		P		P
			E		E		E
			R		R		R
			T		T		T
			I		I		I
			N		N		N
			E		E		E
			N		N		N
			T		T		T

# ETHYLENE OXIDE

EOX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Epoxyethane Oxirane	Liquefied gas	Colorless	Sweet odor
Floats and mixes with water. Flammable, irritating vapor is produced. Boiling point is 51°F.			
Evacuate. Keep people away. Avoid contact with liquid. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE. Containers may explode when heated. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop flow of gas if possible. Combat fires from behind barrier, with unmanned hose holder or monitor noz. Flood discharge area with water. Cool exposed containers and protect men effecting shut off with water. Extinguish with alcohol foam, dry chemical, or carbon dioxide.		
<b>Exposure</b>	CALL FOR MEDICAL AID. Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting and difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open, and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 0; Unassigned cargoes  
2.2 Formula:  $\text{CH}_2\text{CH}_2\text{O}$   
2.3 IMO/UN Designation: 2.0/1040  
2.4 DOT ID No.: 1040  
2.5 CAS Registry No.: 75-21-8  
2.6 NAERG Guide No.: 119  
2.7 Standard Industrial Trade Classification: 51615

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask; goggles or face shield; rubber shoes and coveralls.  
3.2 **Symptoms Following Exposure:** Exposure to low vapor concentrations often results in delayed nausea and vomiting. Higher concentrations produce irritation of eyes, nose, and throat; high concentrations may cause edema of lungs. Contact with skin causes blistering and burns.  
3.3 **Treatment of Exposure:** INHALATION: leave contaminated area immediately; if nausea and vomiting start, call a physician. SKIN OR EYES: flush immediately with plenty of water for at least 15 min. and seek medical attention.  
3.4 TLV-TWA: 1 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral rat  $\text{LD}_{50}$  = .33 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Causes cancer in mice. Effects on humans unknown.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** 50 ppm  
3.13 **IDLH Value:** 800 ppm  
3.14 **OSHA PEL-TWA:** 1 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 5 ppm  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  $<0^\circ\text{F}$  O.C.  
4.2 **Flammable Limits in Air:** 3%-100%  
4.3 **Fire Extinguishing Agents:** Stop flow of gas. Use water, carbon dioxide, dry chemical or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating vapors generated when heated.  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode when heated.  
4.7 **Auto Ignition Temperature:**  $804^\circ\text{F}$   
4.8 **Electrical Hazards:** Class I, group B  
4.9 **Burning Rate:** 3.5 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 11.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 4.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Slow reaction, not hazardous  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** May polymerize violently if contaminated with alkaline or acidic materials and metal oxides or chlorides.  
5.6 **Inhibitor of Polymerization:** None used.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial: 100% Must contain no acetylene  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Inerted  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** 1  
7.7 **Barge Hull Type:** 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison gas  
8.2 **49 CFR Class:** 2.3  
8.3 **49 CFR Package Group:** Not pertinent.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	3

  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** U115  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at  $15^\circ\text{C}$  and 1 atm:** Gas  
9.2 **Molecular Weight:** 44.05  
9.3 **Boiling Point at 1 atm:**  $51.1^\circ\text{F}$  =  $10.6^\circ\text{C}$  =  $283.8^\circ\text{K}$   
9.4 **Freezing Point:**  $-170.7^\circ\text{F}$  =  $-112.6^\circ\text{C}$  =  $160.6^\circ\text{K}$   
9.5 **Critical Temperature:**  $384.8^\circ\text{F}$  =  $196^\circ\text{C}$  =  $469.2^\circ\text{K}$   
9.6 **Critical Pressure:** 1040 psia = 71.0 atm = 7.2 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.869 at  $20^\circ\text{C}$  (liquid)  
9.8 **Liquid Surface Tension:** 24.3 dynes/cm = 0.0243 N/m at  $20^\circ\text{C}$   
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 1.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.212  
9.12 **Latent Heat of Vaporization:** 249.3 Btu/lb = 138.5 cal/g =  $5.799 \times 10^5$  J/kg  
9.13 **Heat of Combustion:**  $-11,480$  Btu/lb =  $-6380$  cal/g =  $-267.1 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:**  $-61$  Btu/lb =  $-34$  cal/g =  $-1.4 \times 10^5$  J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 28.07 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 38.5 psia

### NOTES

# ETHYLENE OXIDE

EOX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-55	60.020	-70	0.442		N		N
-50	59.790	-60	0.445		O		O
-45	59.560	-50	0.447		T		T
-40	59.330	-40	0.449				
-35	59.100	-30	0.451		P		P
-30	58.870	-20	0.453		E		E
-25	58.640	-10	0.456		R		R
-20	58.410	0	0.458		T		T
-15	58.181	10	0.460		I		I
-10	57.950	20	0.462		N		N
-5	57.720	30	0.465		E		E
0	57.490	40	0.467		N		N
5	57.250	50	0.469		T		T
10	57.020						
15	56.790						
20	56.550						
25	56.321						
30	56.090						
35	55.850						
40	55.620						
45	55.380						
50	55.150						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	-35	1.581	-35	0.01528	0	0.227
	I	-30	1.845	-30	0.01762	25	0.239
	S	-25	2.145	-25	0.02025	50	0.250
	C	-20	2.486	-20	0.02320	75	0.261
	I	-15	2.871	-15	0.02650	100	0.272
	B	-10	3.305	-10	0.03016	125	0.283
	L	-5	3.793	-5	0.03423	150	0.293
	E	0	4.340	0	0.03875	175	0.304
		5	4.952	5	0.04373	200	0.315
		10	5.633	10	0.04922	225	0.325
		15	6.392	15	0.05526	250	0.335
		20	7.233	20	0.06188	275	0.345
		25	8.164	25	0.06913	300	0.355
		30	9.193	30	0.07704	325	0.365
		35	10.330	35	0.08566	350	0.375
		40	11.570	40	0.09503	375	0.385
		45	12.940	45	0.10520	400	0.394
		50	14.440	50	0.11620	425	0.404
		55	16.070	55	0.12810	450	0.413
		60	17.850	60	0.14100	475	0.422
		65	19.800	65	0.15480	500	0.431
		70	21.910	70	0.16970	525	0.440
		75	24.200	75	0.18570	550	0.449
		80	26.680	80	0.20290	575	0.458
		85	29.360	85	0.22120	600	0.466
		90	32.260	90	0.24080		

# 2-ETHYL-3-PROPYLACROLEIN

EPA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Ethyl-2-hexenal 2-Ethyl-3-propylacrylaldehyde	Liquid  Yellow  Floats on water.
Avoid contact with liquid. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, alcohol foam or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 19; Aldehyde  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_2\text{CH}=\text{C}(\text{C}_2\text{H}_5)\text{CHO}$   
2.3 IMO/UN Designation: 3.3/1191  
2.4 DOT ID No.: 1191  
2.5 CAS Registry No.: 645-62-5  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective clothing; eye protection; approved respirator for high vapor concentrations.
- 3.2 **Symptoms Following Exposure:** Vapor is irritating. Contact produces skin and eye irritation.
- 3.3 **Treatment of Exposure:** Remove from exposure. Wash affected areas of body with water for 15 min.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 155°F O.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 200°C
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 52% (theor.), 10 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: (T)  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** A
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 126.2
- 9.3 **Boiling Point at 1 atm:** 283°F = 175°C = 448°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.857 at 15°C (liquid)
- 9.8 **Liquid Surface Tension:** 28.2 dynes/cm = 0.0282 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.0282 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** -15,610 Btu/lb = -8670 cal/g = -363 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.07 psia

### NOTES



# 2-ETHYL-3-PROPYLACROLEIN

EPA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	54.360	50	0.525	50	1.109	68	1.280
36	54.290	52	0.525	52	1.109		
38	54.220	54	0.525	54	1.109		
40	54.150	56	0.525	56	1.109		
42	54.090	58	0.525	58	1.109		
44	54.020	60	0.525	60	1.109		
46	53.950	62	0.525	62	1.109		
48	53.880	64	0.525	64	1.109		
50	53.810	66	0.525	66	1.109		
52	53.740	68	0.525	68	1.109		
54	53.670	70	0.525	70	1.109		
56	53.600	72	0.525	72	1.109		
58	53.530	74	0.525	74	1.109		
60	53.460	76	0.525	76	1.109		
62	53.390	78	0.525	78	1.109		
64	53.320	80	0.525	80	1.109		
66	53.250	82	0.525	82	1.109		
68	53.180	84	0.525	84	1.109		
70	53.110	86	0.525	86	1.109		
72	53.040	88	0.525	88	1.109		
74	52.980	90	0.525	90	1.109		
76	52.910	92	0.525	92	1.109		
78	52.840	94	0.525	94	1.109		
80	52.770	96	0.525	96	1.109		
82	52.700	98	0.525	98	1.109		
84	52.630	100	0.525	100	1.109		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	90	0.050	90	0.00107	90	0.303
	N	100	0.069	100	0.00145	100	0.303
	S	110	0.094	110	0.00194	110	0.303
	O	120	0.126	120	0.00256	120	0.303
	L	130	0.169	130	0.00336	130	0.303
	U	140	0.223	140	0.00436	140	0.303
	B	150	0.291	150	0.00561	150	0.303
	L	160	0.378	160	0.00716	160	0.303
	E	170	0.486	170	0.00907	170	0.303
		180	0.620	180	0.01139	180	0.303
		190	0.785	190	0.01421	190	0.303
		200	0.988	200	0.01760	200	0.303
		210	1.233	210	0.02165	210	0.303
		220	1.531	220	0.02647	220	0.303
		230	1.887	230	0.03217	230	0.303
		240	2.314	240	0.03887	240	0.303
		250	2.820	250	0.04671	250	0.303
		260	3.418	260	0.05583	260	0.303
		270	4.121	270	0.06639		
		280	4.943	280	0.07857		
		290	5.901	290	0.09254		
		300	7.012	300	0.10850		
		310	8.295	310	0.12670		
		320	9.770	320	0.14730		
		330	11.460	330	0.17060		
		340	13.390	340	0.19680		

# EPICHLOROHYDRIN

EPC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Chloro-2,3-epoxypropane Chloromethyloxirane 3-Chloro-1, 2-propylene oxide gamma-Chloropropylene oxide	Watery liquid      Colorless      Sweet garlic odor  Sinks and mixes with water. Poisonous, flammable vapor is produced.
<b>Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from safe distance or protected location. Extinguish with water, dry chemical, alcohol foam or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink or milk, and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 17;  
Epichlorohydrin  
2.2 Formula:  $O'CH_2CHCH_2Cl$   
2.3 IMO/UN Designation: 6.1/2023  
2.4 DOT ID No.: 2023  
2.5 CAS Registry No.: 106-89-8  
2.6 NAERG Guide No.: 131P  
2.7 Standard Industrial Trade Classification: 51615

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air pack or organic canister mask; protective gloves and goggles.  
3.2 **Symptoms Following Exposure:** Vapor is irritating to eyes, nose, and throat; may cause headache, nausea, vomiting, and central nervous system depression. Rapidly fatal if swallowed, i.e., nausea, vomiting, and collapse. Skin contact is irritating.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air, keep him warm and quiet, and get medical attention immediately; if breathing stops, start artificial respiration. INGESTION: induce vomiting (but only if victim is conscious and without convulsions) and call a physician promptly; no specific antidote known. EYES OR SKIN: immediately flush with water for at least 15 min. and get medical attention; remove contaminated clothing and wash before reuse.  
3.4 TLV-TWA: 0.5 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3;  $LD_{50} = 50$  to 500 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Causes cancer in experimental animals.  
3.10 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
3.11 Liquid or Solid Characteristics: Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.  
3.12 Odor Threshold: 10 ppm  
3.13 IDLH Value: 75 ppm  
3.14 OSHA PEL-TWA: 5 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 92°F O.C. 100°F C.C.  
4.2 Flammable Limits in Air: 3.8%-21.0%  
4.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide, water spray  
4.4 Fire Extinguishing Agents Not to Be Used: Avoid use of dry chemical if fire occurs in container with confined vent.  
4.5 Special Hazards of Combustion Products: Toxic, irritating vapors are generated when heated.  
4.6 Behavior in Fire: Containers may explode in fire because of polymerization.  
4.7 Auto Ignition Temperature: 772°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: 2.6 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 16.7 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 6.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Mild reaction; not likely to be hazardous.  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Can polymerize in presence of strong acids and bases, particularly when hot.  
5.6 Inhibitor of Polymerization: None used

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 36 ppm/48 hr/Rasbora (fish)/TL<sub>50</sub>/freshwater  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99.0%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Pressure-vacuum  
7.5 IMO Pollution Category: A  
7.6 Ship Type: 2  
7.7 Barge Hull Type: 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	2

  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: U041  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 92.53  
9.3 Boiling Point at 1 atm: 239.4°F = 115.2°C = 388.4°K  
9.4 Freezing Point: -72.6°F = -58.1°C = 215.1°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.18 at 20°C (liquid)  
9.8 Liquid Surface Tension: 37.0 dynes/cm = 0.037 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.155  
9.12 Latent Heat of Vaporization: 176 Btu/lb = 97.9 cal/g =  $4.10 \times 10^5$  J/kg  
9.13 Heat of Combustion: -8143 Btu/lb = -4524 cal/g =  $-189.4 \times 10^5$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.67

### NOTES

# EPICHLOROHYDRIN

EPC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	74.750	15	0.311	0	0.469	35	1.516
50	74.309	20	0.314	10	0.474	40	1.444
60	73.879	25	0.316	20	0.478	45	1.376
70	73.440	30	0.319	30	0.483	50	1.312
80	73.000	35	0.321	40	0.487	55	1.252
90	72.559	40	0.324	50	0.492	60	1.197
100	72.120	45	0.326	60	0.496	65	1.144
110	71.679	50	0.329	70	0.501	70	1.095
120	71.240	55	0.331	80	0.505	75	1.049
130	70.799	60	0.334	90	0.510	80	1.006
140	70.360	65	0.336	100	0.514	85	0.965
150	69.910	70	0.339	110	0.519	90	0.927
160	69.469	75	0.341	120	0.523	95	0.890
170	69.020	80	0.344	130	0.528	100	0.856
180	68.570	85	0.346	140	0.532		
190	68.120	90	0.349	150	0.537		
200	67.679	95	0.351	160	0.541		
210	67.230	100	0.354	170	0.545		
220	66.770	105	0.356	180	0.550		
230	66.320	110	0.359	190	0.554		
		115	0.361	200	0.559		
		120	0.364	210	0.563		
		125	0.366				
		130	0.369				
		135	0.371				
		140	0.374				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	6.000	20	0.044	20	0.00079	0	0.136
		30	0.065	30	0.00114	25	0.145
		40	0.094	40	0.00161	50	0.154
		50	0.133	50	0.00226	75	0.162
		60	0.188	60	0.00311	100	0.170
		70	0.261	70	0.00424	125	0.178
		80	0.358	80	0.00572	150	0.185
		90	0.486	90	0.00762	175	0.192
		100	0.652	100	0.01004	200	0.199
		110	0.866	110	0.01310	225	0.206
		120	1.139	120	0.01693	250	0.212
		130	1.484	130	0.02169	275	0.218
		140	1.916	140	0.02755	300	0.223
		150	2.455	150	0.03471	325	0.228
		160	3.119	160	0.04339	350	0.233
		170	3.933	170	0.05385	375	0.238
		180	4.924	180	0.06636	400	0.242
		190	6.123	190	0.08123	425	0.246
		200	7.562	200	0.09881	450	0.250
		210	9.281	210	0.11950	475	0.254
						500	0.257
						525	0.259
						550	0.262
						575	0.264
						600	0.265

# ETHYL PHOSPHONOTHIOIC DICHLORIDE

EPD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethyl phosphorodichlorodithionate Ethyl thionophosphoryl dichloride	Liquid                      Colorless                      Choking odor  Reacts with water. Poisonous gas is produced on contact with water.
Keep people away. Avoid inhalation. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE.
<b>Exposure</b>	CALL FOR MEDICAL AID. GAS PRODUCED IN REACTION WITH WATER. POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Collection Systems: Pump  
 Chemical and Physical Treatment:  
 Neutralize  
 Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula:  $\text{CH}_3\text{CH}_2\text{PSCl}_2$   
 2.3 IMO/UN Designation: 8/1760  
 2.4 DOT ID No.: 2927  
 2.5 CAS Registry No.: Currently not available  
 2.6 NAERG Guide No.: 154  
 2.7 Standard Industrial Trade Classification: 51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air mask; rubber or neoprene gloves; vapor-tight goggles.  
 3.2 **Symptoms Following Exposure:** Inhalation of vapor causes pulmonary and eye irritation; effects on lungs may be delayed 24 hours; very similar to phosgene poisoning. Contact with liquid causes painful irritation of eyes and lachrymation; also causes severe irritation and possible damage to skin. Ingestion causes severe irritation of mouth and stomach.  
 3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; oxygen can be used for pulmonary symptoms with decongestants; enforce complete rest, because effects may be delayed 24 hours; similar to phosgene poisoning. EYES: flush thoroughly with water and seek medical attention; apply Pontocaine drops (1/2%) and cortisone ointment (1%). SKIN: wash thoroughly with soap and water. INGESTION: give large amounts of water; induce vomiting; get medical attention; enforce rest for 24-36 hours.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2:  $\text{LD}_{50} = 0.5$  to 5 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 203°F O.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam  
 4.5 **Special Hazards of Combustion Products:** Oxides of sulfur, phosphorus; hydrogen chloride and phosgene.  
 4.6 **Behavior in Fire:** Contact with water applied to adjacent fires will produce irritating fumes of hydrogen chloride.  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 19.0 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with water to evolve hydrogen chloride (hydrochloric acid)  
 5.2 **Reactivity with Common Materials:** Will react with surface moisture to evolve hydrogen chloride, which is corrosive to common metals.  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution.  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** Inerted with dry nitrogen.  
 7.4 **Venting:** Pressure-vacuum  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
 8.2 **49 CFR Class:** 6.1  
 8.3 **49 CFR Package Group:** I  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 163  
 9.3 **Boiling Point at 1 atm:** 342°F = 172°C = 445°K  
 9.4 **Freezing Point:** <-58°F = <-50°C = <223°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 1.35 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** (est.) 28 dynes/cm = 0.028 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** Not pertinent  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** -7,700 Btu/lb = -4,280 cal/g = -179 X 10<sup>3</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Currently not available  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYL PHOSPHONOTHIOIC DICHLORIDE

EPD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	89.820	65	0.241	51	1.129	51	9.018
54	89.129	70	0.244	52	1.129	52	8.773
56	88.429	75	0.248	53	1.129	53	8.535
58	87.740	80	0.252	54	1.129	54	8.305
60	87.049	85	0.256	55	1.129	55	8.082
62	86.349	90	0.259	56	1.129	56	7.865
64	85.660	95	0.263	57	1.129	57	7.656
66	84.959	100	0.267	58	1.129	58	7.452
68	84.270	105	0.271	59	1.129	59	7.255
70	83.580	110	0.274	60	1.129	60	7.064
72	82.879	115	0.278	61	1.129	61	6.879
74	82.190	120	0.282	62	1.129	62	6.699
76	81.500	125	0.286	63	1.129	63	6.524
78	80.799	130	0.289	64	1.129	64	6.355
80	80.110			65	1.129	65	6.190
82	79.419			66	1.129	66	6.031
84	78.719			67	1.129	67	5.876
86	78.030			68	1.129	68	5.726
				69	1.129	69	5.580
				70	1.129	70	5.438
				71	1.129	71	5.301
				72	1.129	72	5.167
				73	1.129	73	5.037
				74	1.129	74	4.911
				75	1.129	75	4.789
				76	1.129	76	4.670

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	55	0.017	55	0.00051		N
	E	60	0.020	60	0.00059		O
	A	65	0.024	65	0.00070		T
	C	70	0.028	70	0.00081		
	T	75	0.033	75	0.00095		P
	S	80	0.039	80	0.00110		E
		85	0.046	85	0.00127		R
		90	0.053	90	0.00147		T
		95	0.062	95	0.00170		I
		100	0.072	100	0.00196		N
		105	0.084	105	0.00225		E
		110	0.097	110	0.00258		N
		115	0.112	115	0.00296		T
		120	0.129	120	0.00338		
		125	0.148	125	0.00385		
		130	0.170	130	0.00438		
		135	0.195	135	0.00498		
		140	0.223	140	0.00564		
		145	0.254	145	0.00638		
		150	0.289	150	0.00721		
		155	0.329	155	0.00813		
		160	0.373	160	0.00915		
		165	0.423	165	0.01028		
		170	0.478	170	0.01154		
		175	0.540	175	0.01292		

# ETHYLENE GLYCOL PHENYL ETHER

EPE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arosol Dowanol EP Dowanol EPH Emergence 1160 Emery 6705 1-Hydroxy-2-phenoxyethane 2-Phenoxyethanol Phenyl cellosolve Rose ether	Liquid                      Colorless                      Pleasant
<p>Call fire department.  Avoid contact with liquid.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, induce vomiting.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ethers  
2.2 Formula: C<sub>8</sub>H<sub>10</sub>OCH<sub>2</sub>CH<sub>2</sub>OH  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 122-99-6  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Positive pressure self-contained breathing apparatus, protective clothing chemical goggles, gloves and boots.  
3.2 **Symptoms Following Exposure:** May cause moderate eye irritation and moderate corneal injury. Excessive exposure may cause skin irritation and hemolysis.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove to fresh air. INGESTION: Induce vomiting if large amounts are ingested. SKIN: Wash off in flowing water or shower. EYES: Irrigate with flowing water immediately and continuously for 15 minutes.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 1.26 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Liver, kidney, thyroid and blood effects.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of eyes and respiratory system if present in high concentration. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 250°F  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water fog, carbon dioxide, dry chemical, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 45.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Will not occur  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 90%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 138.2  
9.3 **Boiling Point at 1 atm:** 474.08°F = 245.6°C = 518.8°K  
9.4 **Freezing Point:** 51°F = 11°C = 284.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.104  
9.8 **Liquid Surface Tension:** 42 dynes/cm = 0.042 N/m  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.8  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYLENE GLYCOL PHENYL ETHER

EPE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	68.800		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.300	77 172 224 250 277 306 326 350 388 430 474	0.000 0.019 0.097 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.255 0.266 0.277 0.288 0.298 0.309 0.319 0.329 0.339 0.349 0.359 0.368 0.377 0.386 0.395 0.404 0.413 0.421 0.429 0.438 0.446 0.453 0.461 0.469 0.476

# ETHYLPHENOL

EPL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Ethylphenol o-Ethylphenol Phenol, o-ethyl Phlorol	Liquid  Yellow
<b>AVOID CONTACT WITH LIQUID AND SOLID.</b> Keep people away. Avoid inhalation. Wear full-face self-contained breathing apparatus and full protective clothing including rubber boots and gloves. Call fire department. Evacuate area in case of large discharge. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear full-face self-contained breathing apparatus and full protective clothing including rubber boots and gloves. Extinguish with water, CO <sub>2</sub> , dry chemical, or alcohol foam. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Dilute and disperse Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 21; Phenols and Cresols <b>2.2 Formula:</b> C <sub>8</sub> H <sub>8</sub> O <b>2.3 IMO/UN Designation:</b> Currently not available <b>2.4 DOT ID No.:</b> Not listed <b>2.5 CAS Registry No.:</b> 90-00-6 <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 51243
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves. <b>3.2 Symptoms Following Exposure:</b> Harmful if swallowed, inhaled, or absorbed through skin. Irritating to mucous membranes, upper respiratory tract, eyes and skin. Can cause damage to the eyes and severe irritation or burn. <b>3.3 Treatment of Exposure:</b> INHALATION: Call for medical aid. Remove the victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES - OR - SKIN: Flush with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes. Ensure adequate flushing of the eyes by separating the eyelids with the fingers. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.6 g/kg (mouse) <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. <b>3.11 Liquid or Solid Characteristics:</b> Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 173°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Currently not available  
**4.5 Special Hazards of Combustion Products:** Emits toxic fumes under fire conditions.  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 47.6 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** Currently not available  
**5.2 Reactivity with Common Materials:** Currently not available  
**5.3 Stability During Transport:** Currently not available  
**5.4 Neutralizing Agents for Acids and Caustics:** Dry lime or soda ash.  
**5.5 Polymerization:** Currently not available  
**5.6 Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 99%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** A  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed.  
**8.2 49 CFR Class:** Not pertinent.  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 122.17  
**9.3 Boiling Point at 1 atm:** 383-386.6°F = 195-197°C = 468.2-470.2°K  
**9.4 Freezing Point:** -0.4°F = -18°C = 255.2°K  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 1.037  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** 4.21  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** <0.01 psia

## NOTES



# ETHYLPHENOL

EPL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	115 164 189 215 244 262 287 323 364 406	0.019 0.097 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.261 0.274 0.286 0.299 0.311 0.322 0.334 0.345 0.357 0.368 0.378 0.389 0.400 0.410 0.420 0.430 0.440 0.450 0.459 0.468 0.478 0.487 0.496 0.504 0.513

# ETHYL PHOSPHORODICHLORIDATE

EPP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethyl dichlorophosphate Phosphorodichloric acid, ethyl ester	Liquid  Colorless  Choking odor  Reacts with water. Irritating gas is produced on contact with water.
<b>KEEP PEOPLE AWAY.</b> Avoid inhalation. <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{Cl}_2(\text{OC}_2\text{H}_5)\text{PO}$   
2.3 IMO/UN Designation: 8/1760  
2.4 DOT ID No.: 2927  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles and face shield; self-contained or air-line respirator; rubber gloves, boots, and clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation of vapor irritates nose and throat. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; if his breathing has stopped, start artificial respiration, call a doctor. EYES: flush with water for at least 15 min.; get medical attention for burns. SKIN: flush with water; get medical attention for burns. INGESTION: do NOT induce vomiting; give large amounts of water, followed by milk or milk of magnesia.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available.  
3.11 **Liquid or Solid Characteristics:** Currently not available.  
3.12 **Odor Threshold:** Currently not available.  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam
- 4.5 **Special Hazards of Combustion Products:** Irritating fumes of hydrogen chloride and phosphoric acid may be formed.
- 4.6 **Behavior in Fire:** Contact with water applied to adjacent fires produces irritating fumes of hydrogen chloride.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 16.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with water to evolve hydrogen chloride (hydrochloric acid).
- 5.2 **Reactivity with Common Materials:** Will react with surface moisture to evolve hydrogen chloride, which is corrosive to common metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 162.9
- 9.3 Boiling Point at 1 atm: 333°F = 167°C = 440°K
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.35 at 19°C (liquid)
- 9.8 Liquid Surface Tension: (est.) 32.8 dynes/cm = 0.0328 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: (est.) -4,700 Btu/lb = -2,600 cal/g = -110 X 10<sup>3</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ETHYL PHOSPHORODICHLORIDATE

EPP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	84.759	51	0.500	51	1.129	51	9.018
54	84.690	52	0.500	52	1.129	52	8.773
56	84.620	53	0.500	53	1.129	53	8.535
58	84.549	54	0.500	54	1.129	54	8.305
60	84.480	55	0.500	55	1.129	55	8.082
62	84.419	56	0.500	56	1.129	56	7.865
64	84.349	57	0.500	57	1.129	57	7.656
66	84.280	58	0.500	58	1.129	58	7.452
68	84.209	59	0.500	59	1.129	59	7.255
70	84.139	60	0.500	60	1.129	60	7.064
72	84.070	61	0.500	61	1.129	61	6.879
74	84.000	62	0.500	62	1.129	62	6.699
76	83.929	63	0.500	63	1.129	63	6.524
78	83.860	64	0.500	64	1.129	64	6.355
80	83.790	65	0.500	65	1.129	65	6.190
82	83.719	66	0.500	66	1.129	66	6.031
84	83.650	67	0.500	67	1.129	67	5.876
86	83.580	68	0.500	68	1.129	68	5.726
		69	0.500	69	1.129	69	5.580
		70	0.500	70	1.129	70	5.438
		71	0.500	71	1.129	71	5.301
		72	0.500	72	1.129	72	5.167
		73	0.500	73	1.129	73	5.037
		74	0.500	74	1.129	74	4.911
		75	0.500	75	1.129	75	4.789
		76	0.500	76	1.129	76	4.670

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	285	6.803	285	0.13860		N
	E	290	7.410	290	0.15000		O
	A	295	8.062	295	0.16210		T
	C	300	8.761	300	0.17500		
	T	305	9.511	305	0.18880		P
	S	310	10.310	310	0.20340		E
		315	11.170	315	0.21890		R
		320	12.090	320	0.23530		T
		325	13.070	325	0.25280		I
		330	14.120	330	0.27130		N
		335	15.230	335	0.29090		E
		340	16.420	340	0.31160		N
		345	17.680	345	0.33350		T
		350	19.030	350	0.35660		
		355	20.450	355	0.38100		

# ETHYL PROPIONATE

EPR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Propanoic acid, ethyl ester	Liquid  Colorless  Pineapple-like  Floats on water.
Avoid inhalation. Wear full impervious protective clothing and approved respirator. Shut off all possible sources of ignition. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Flammable. Vapors can flow to distant ignition source and flash back. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Overexposures may have a narcotic effect. Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Contain  
Collection Systems: Skim  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $C_5H_{10}O_2$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: 1195  
2.5 CAS Registry No.: 105-37-3  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat. May cause shortness of breath or coughing. High concentrations have a narcotic effect. May cause abdominal pain and vomiting if swallowed.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. Contact lenses should not be worn when working with this chemical. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral rat  $LD_{50}$  = 3.5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 54°F C.C.
- 4.2 **Flammable Limits in Air:** LEL: 1.8%; UEL: 11.0%
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.
- 4.6 **Behavior in Fire:** Vapors can flow along surfaces to distant ignition source and flash back.
- 4.7 **Auto Ignition Temperature:** 887°F.
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Can react with oxidizing agents, bases, and acids.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%; technical.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Not listed.
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable Liquid
- 8.2 49 CFR Class: 3
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | -              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 102.13
- 9.3 Boiling Point at 1 atm: 210°F = 99°C = 372°K
- 9.4 Freezing Point: -99°F = -73°C = 200°K
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 0.891
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: 3.52
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent.
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ETHYL PROPIONATE

EPR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E	81	0.774	81	0.01361		C U R R E N T L Y  N O T  A V A I L A B L E

# ETHYLPHENYLDICHLOROSILANE

EPS

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless	Sharp irritating odor
Reacts with water. Poisonous gas is produced on contact with water.			
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
Fire	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE.		
Exposure	CALL FOR MEDICAL AID. GAS PRODUCED IN REACTION WITH WATER. POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
Water Pollution	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not burn  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (C<sub>6</sub>H<sub>5</sub>)(C<sub>2</sub>H<sub>5</sub>)SiCl<sub>2</sub>  
2.3 IMO/UN Designation: 8/1760  
2.4 DOT ID No.: 2435  
2.5 CAS Registry No.: 1125-27-5  
2.6 NAERG Guide No.: 156  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Acid-vapor-type respiratory protection; rubber gloves; chemical worker's goggles; other equipment as necessary to protect skin and eyes.  
3.2 **Symptoms Following Exposure:** Inhalation irritates nose and throat. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give artificial respiration if needed; call physician. EYES: flush with water for 15 min.; obtain medical attention immediately. SKIN: flush with water; obtain medical attention if burning has occurred. INGESTION: if victim is conscious, give large amounts of water, then induce vomiting; get medical attention.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** >150°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam  
4.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene fumes may be formed.  
4.6 **Behavior in Fire:** Difficult to extinguish; re-ignition may occur. Contact with water applied to adjacent fires will generate irritating hydrogen chloride gas.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 3.7 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** Reacts with water to generate hydrogen chloride (hydrochloric acid)  
5.2 **Reactivity with Common Materials:** Will react with surface moisture to evolve hydrogen chloride, which is corrosive to common metals.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 205.1  
9.3 **Boiling Point at 1 atm:** >300°F = >149°C = >422°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.159 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 103 Btu/lb = 57 cal/g = 2.4 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -9,900 Btu/lb = -5,500 cal/g = -230 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYLPHENYLDICHLOROSILANE

EPS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	72.589	60	0.400	51	0.967	60	7.064
54	72.520	61	0.400	52	0.967	61	6.879
56	72.450	62	0.400	53	0.967	62	6.699
58	72.379	63	0.400	54	0.967	63	6.524
60	72.309	64	0.400	55	0.967	64	6.355
62	72.240	65	0.400	56	0.967	65	6.190
64	72.169	66	0.400	57	0.967	66	6.031
66	72.099	67	0.400	58	0.967	67	5.876
68	72.040	68	0.400	59	0.967	68	5.726
70	71.969	69	0.400	60	0.967	69	5.580
72	71.900	70	0.400	61	0.967	70	5.438
74	71.830	71	0.400	62	0.967	71	5.301
76	71.759	72	0.400	63	0.967	72	5.167
78	71.690	73	0.400	64	0.967	73	5.037
80	71.620	74	0.400	65	0.967	74	4.911
82	71.549	75	0.400	66	0.967	75	4.789
84	71.480	76	0.400	67	0.967	76	4.670
86	71.410	77	0.400	68	0.967	77	4.555
		78	0.400	69	0.967		
		79	0.400	70	0.967		
		80	0.400	71	0.967		
		81	0.400	72	0.967		
		82	0.400	73	0.967		
		83	0.400	74	0.967		
		84	0.400	75	0.967		
		85	0.400	76	0.967		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	130	0.029	130	0.00093		N
	E	140	0.039	140	0.00123		O
	A	150	0.052	150	0.00162		T
	C	160	0.068	160	0.00211		P
	T	170	0.090	170	0.00273		E
	S	180	0.117	180	0.00349		R
		190	0.151	190	0.00444		T
		200	0.193	200	0.00560		I
		210	0.246	210	0.00702		N
		220	0.311	220	0.00874		E
		230	0.390	230	0.01080		N
		240	0.486	240	0.01327		T
		250	0.602	250	0.01620		
		260	0.741	260	0.01967		
		270	0.907	270	0.02375		
		280	1.104	280	0.02853		
		290	1.338	290	0.03409		
		300	1.612	300	0.04054		
		310	1.933	310	0.04798		
		320	2.307	320	0.05654		
		330	2.742	330	0.06634		
		340	3.244	340	0.07751		
		350	3.822	350	0.09020		
		360	4.486	360	0.10460		
		370	5.244	370	0.12080		
		380	6.108	380	0.13900		

# ETHYL SILICATE

ESC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethyl orthosilicate Ethyl silicate 40 Ethyl silicate condensed Silibond Tetraethyl orthosilicate Tetraethyl silicate	Watery liquid  Colorless  Mild odor  May float or sink in water. Reacts slowly with water.
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (C<sub>2</sub>H<sub>5</sub>O)<sub>2</sub>Si  
2.3 IMO/UN Designation: 3.3/1292  
2.4 DOT ID No.: 1292  
2.5 CAS Registry No.: 78-10-4  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber or polyethylene gloves; safety glasses or other form of eye protection; self-contained breathing apparatus or one that absorbs organic vapors.  
3.2 **Symptoms Following Exposure:** Inhalation of vapor causes eye and nose irritation, unsteadiness, tremors, salivation, respiratory difficulty, and unconsciousness. Contact with liquid irritates eyes and may cause dryness, cracking, and inflammation of skin. Ingestion may produce nausea, vomiting, and cramps.  
3.3 **Treatment of Exposure:** INHALATION: move patient from contaminated atmosphere; if his breathing has ceased, start mouth-to-mouth artificial respiration; oxygen, if available, should be administered only by an experienced person when authorized by a physician; keep patient warm and comfortable; call physician immediately. EYES: flush immediately with large quantities of running water for at least 15 min.; obtain medical attention if irritation persists. SKIN: immediately flush affected areas with large volumes of water; obtain medical attention if irritation persists. INGESTION: give large amounts of water or warm salty water and induce vomiting; milk, eggs or olive oil may then be given; obtain medical attention if abdominal discomfort persists.  
3.4 TLV-TWA: 10 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Liver, kidney, and lung damage may result from overexposures by inhalation or ingestion.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** 85 ppm  
3.13 IDLH Value: 700 ppm  
3.14 OSHA PEL-TWA: 100 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 125°F O.C. 99°F C.C.  
4.2 **Flammable Limits in Air:** 1.3%-23%  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 4.4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 19.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly, forming non-toxic silica and ethyl alcohol.  
5.2 **Reactivity with Common Materials:** Causes swelling and hardening of some plastics.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 90-99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 208.3  
9.3 **Boiling Point at 1 atm:** 336°F = 169°C = 442°K  
9.4 **Freezing Point:** -121.9°F = -85.5°C = 187.7°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.933 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 22.8 dynes/cm = 0.0228 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 95 Btu/lb = 53 cal/g = 2.2 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -12,000 Btu/lb = -6,700 cal/g = -280 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ETHYL SILICATE

ESC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	59.380	52	0.430	51	1.048	55	0.764
40	59.210	54	0.430	52	1.048	60	0.737
45	59.040	56	0.430	53	1.048	65	0.712
50	58.860	58	0.430	54	1.048	70	0.689
55	58.690	60	0.430	55	1.048	75	0.666
60	58.520	62	0.430	56	1.048	80	0.645
65	58.340	64	0.430	57	1.048	85	0.625
70	58.170	66	0.430	58	1.048	90	0.606
75	58.000	68	0.430	59	1.048	95	0.587
80	57.820	70	0.430	60	1.048	100	0.570
85	57.650	72	0.430	61	1.048	105	0.553
90	57.480	74	0.430	62	1.048	110	0.537
95	57.300	76	0.430	63	1.048	115	0.522
100	57.130	78	0.430	64	1.048	120	0.508
105	56.960	80	0.430	65	1.048	125	0.494
110	56.780	82	0.430	66	1.048	130	0.481
115	56.610	84	0.430	67	1.048	135	0.468
120	56.440	86	0.430	68	1.048	140	0.456
125	56.260	88	0.430	69	1.048	145	0.444
130	56.090	90	0.430	70	1.048	150	0.433
135	55.920	92	0.430	71	1.048	155	0.422
140	55.740	94	0.430	72	1.048		
145	55.570	96	0.430	73	1.048		
150	55.400	98	0.430	74	1.048		
155	55.220	100	0.430	75	1.048		
		102	0.430	76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	60	0.029	60	0.00110		N
	E	70	0.041	70	0.00151		O
	A	80	0.057	80	0.00206		T
	C	90	0.078	90	0.00276		
	T	100	0.106	100	0.00367		P
	S	110	0.142	110	0.00483		E
		120	0.188	120	0.00629		R
		130	0.247	130	0.00812		T
		140	0.321	140	0.01039		I
		150	0.414	150	0.01318		N
		160	0.529	160	0.01658		E
		170	0.672	170	0.02071		N
		180	0.847	180	0.02568		T
		190	1.059	190	0.03163		
		200	1.316	200	0.03870		
		210	1.624	210	0.04705		
		220	1.992	220	0.05687		
		230	2.429	230	0.06835		
		240	2.945	240	0.08169		
		250	3.552	250	0.09713		
		260	4.262	260	0.11490		
		270	5.087	270	0.13530		
		280	6.044	280	0.15850		
		290	7.147	290	0.18500		
		300	8.415	300	0.21490		
		310	9.865	310	0.24870		

# ENDOSULFAN

ESF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlorthepin Cyclodan Malix Thiodan	Solid crystals or solution  Brown  Sulfur dioxide  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND SOLID.</b> Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available for solid, but usually it is dissolved in a combustible liquid. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR SOLUTION POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_8H_6Cl_6O_3S$   
2.3 IMO/UN Designation: 6.1/2761  
2.4 DOT ID No.: 2761  
2.5 CAS Registry No.: 115-29-7  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, mask, or respirator.  
3.2 **Symptoms Following Exposure:** Ingestion, inhalation, and skin absorption will induce headache, dizziness, nausea, and vomiting. CNS symptoms: hyperirritability, convulsions, and/or coma. SKIN: In solution in oily media, surfactants, or emulsifiers, may result in skin irritation.  
3.3 **Treatment of Exposure:** Call a doctor. EYES: Wash with water for at least 15 minutes. SKIN: Wash with soap and water. INGESTION: Remove by administration of syrup of ipecac, gastric lavage, and salt-based cathartics. OTHER: Get medical attention. For CNS symptoms phenobarbital may be used.  
3.4 **TLV-TWA:** 0.1 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> <50 mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Occasional epileptiform convulsions of grand mal or petit mal type have occurred in workers from skin absorption. Neoplastic effects have been reported.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** As a solution incorporated in oily media or with surfactants or emulsifiers. Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup>  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Currently not available  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Decomposes to liberate SO<sub>2</sub>  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Slowly hydrolyzes to give SO<sub>2</sub>. Hydrolyzes more rapidly under alkaline conditions.  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable when dry.  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.0033 and 0.0037 ppm/96-hour/LC<sub>50</sub>/Fat-head minnows and guppy/fresh water  
0.013 to 0.0032 ppm/24-hour/LC<sub>50</sub>/Rain-bow trout/fresh water  
0.03 to 1.0 ppm/48-hour/LC<sub>50</sub>/Pogge/salt water  
6.2 **Waterfowl Toxicity:** Oral - LD<sub>50</sub>, young mallards = 33 mg/kg  
Oral - Mallards LD<sub>50</sub> (5-day) = 900 to 1100 ppm  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Will occur  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 4  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 35%, 50% (wetttable powders); 17.5%, 35%, 50% (emulsifiable concen- trates); 2 lb/gal; 1%, 2%, 3%, 4%, 5%, and 6% (dusts)  
7.2 **Storage Temperature:** >20°F (miscible)  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1 pound  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** P050  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 406.95  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Technical grade: 158° to 212°F = 70° to 100°C = 343.2 to 373.2°K  
Pure para isomer: 222.8° to 226.4°F = 106° to 108°C = 379.2° to 381.2°K  
Pure ortho isomer: 406.4° to 410°F = 208° to 210°C = 481.2° to 483.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.745 at 20°C  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 14.0  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ENDOSULFAN

ESF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	167	0.000		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# ETHYL ACETATE

ETA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic ester Acetic ether Acetic acid, ethyl ester Ethyl ethanoate Vinegar naphtha	Watery liquid      Colorless      Pleasant fruity odor  Floats on water. Flammable, irritating vapor is produced.
Keep people away. Avoid inhalation. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, nausea, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Contain  
 Collection Systems: Skim  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
 2.2 Formula:  $\text{CH}_3\text{COOCH}_2\text{CH}_3$   
 2.3 IMO/UN Designation: 3.2/1173  
 2.4 DOT ID No.: 1173  
 2.5 CAS Registry No.: 141-78-6  
 2.6 NAERG Guide No.: 129  
 2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Organic vapor canister or air mask; goggles or face shield.  
 3.2 **Symptoms Following Exposure:** Headache, irritation of respiratory passages and eyes, dizziness and nausea, weakness, loss of consciousness.  
 3.3 **Treatment of Exposure:** INHALATION: if victim is overcome, move him to fresh air immediately and call a physician; if breathing is irregular or stopped, start resuscitation and administer oxygen.  
 EYES: flush with water for at least 15 min.  
 3.4 **TLV-TWA:** 400 ppm  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to  $5$  g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** 1 ppm  
 3.13 **IDLH Value:** 2,000 ppm  
 3.14 **OSHA PEL-TWA:** 400 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 55°F O.C. 24°F C.C.  
 4.2 **Flammable Limits in Air:** 2.2%-9.0%  
 4.3 **Fire Extinguishing Agents:** Alcohol foam, carbon dioxide or dry chemicals  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 800°F  
 4.8 **Electrical Hazards:** Class I, group D  
 4.9 **Burning Rate:** 3.7 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 23.8 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):**  $\text{N}_2$  diluent: 11.2%

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** (Theor.) 66%, 5 days  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 1  
 Human Oral hazard: 0  
 Human Contact hazard: 0  
 Reduction of amenities: 0

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 85-100%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
 7.5 **IMO Pollution Category:** D  
 7.6 **Ship Type:** Data not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** 5000 pounds  
 8.7 **EPA Pollution Category:** D  
 8.8 **RCRA Waste Number:** U112  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 88.11  
 9.3 **Boiling Point at 1 atm:** 171°F = 77°C = 350°K  
 9.4 **Freezing Point:** -117°F = -83°C = 190°K  
 9.5 **Critical Temperature:** 482.0°F = 250°C = 523.2°K  
 9.6 **Critical Pressure:** 558 psia = 38 atm = 3.8 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.902 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** 6.79 dynes/cm = 0.00679 N/m at 30°C  
 9.10 **Vapor (Gas) Specific Gravity:** 3.0  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.080  
 9.12 **Latent Heat of Vaporization:** 158 Btu/lb = 87.6 cal/g =  $3.67 \times 10^5$  J/kg  
 9.13 **Heat of Combustion:** -10,110 Btu/lb = -5616 cal/g = -235.1  $\times 10^5$  J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** 28.43 cal/g  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 3.27 psia

### NOTES

# ETHYL ACETATE

ETA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	57.620	15	0.444	35	1.053	35	0.565
40	57.410	20	0.446	40	1.047	40	0.545
45	57.190	25	0.448	45	1.041	45	0.526
50	56.980	30	0.449	50	1.035	50	0.507
55	56.760	35	0.451	55	1.029	55	0.490
60	56.550	40	0.453	60	1.024	60	0.473
65	56.330	45	0.454	65	1.018	65	0.458
70	56.100	50	0.456	70	1.012	70	0.443
75	55.880	55	0.458	75	1.006	75	0.429
80	55.660	60	0.459	80	1.000	80	0.416
85	55.430	65	0.461	85	0.994	85	0.403
90	55.200	70	0.463	90	0.989	90	0.391
95	54.970	75	0.464	95	0.983	95	0.379
100	54.730	80	0.466	100	0.977	100	0.368
		85	0.468	105	0.971	105	0.358
		90	0.469	110	0.965	110	0.348
		95	0.471	115	0.959	115	0.338
		100	0.473	120	0.954	120	0.329
		105	0.474	125	0.948	125	0.320
		110	0.476	130	0.942	130	0.312
		115	0.478	135	0.936	135	0.304
		120	0.479	140	0.930	140	0.296
		125	0.481			145	0.289
		130	0.483			150	0.282
		135	0.484			155	0.275
		140	0.486				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	8.700	70	1.452	70	0.02251	0	0.282
		75	1.666	75	0.02557	25	0.290
		80	1.905	80	0.02898	50	0.299
		85	2.174	85	0.03277	75	0.307
		90	2.475	90	0.03696	100	0.316
		95	2.811	95	0.04160	125	0.325
		100	3.186	100	0.04672	150	0.333
		105	3.602	105	0.05236	175	0.342
		110	4.064	110	0.05855	200	0.351
		115	4.575	115	0.06535	225	0.360
		120	5.140	120	0.07279	250	0.369
		125	5.764	125	0.08092	275	0.378
		130	6.450	130	0.08979	300	0.387
		135	7.205	135	0.09945	325	0.396
		140	8.034	140	0.11000	350	0.405
		145	8.941	145	0.12140	375	0.415
		150	9.934	150	0.13370	400	0.424
		155	11.020	155	0.14710	425	0.433
		160	12.200	160	0.16160	450	0.443
		165	13.490	165	0.17720	475	0.452
		170	14.880	170	0.19400	500	0.462
		175	16.400	175	0.21210	525	0.471
						550	0.481
						575	0.491
						600	0.501

# ETHYLBENZENE

ETB

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms EB Phenylethane	Liquid	Colorless	Sweet, gasoline-like odor
	Floats on water. Flammable, irritating vapor is produced.		
<p>Keep people away. Avoid contact with liquid and vapor.</p> <p>Avoid inhalation.</p> <p>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</p> <p>Shut off ignition sources and call fire department.</p> <p>Stay upwind and use water spray to "knock down" vapor.</p> <p>Notify local health and pollution control agencies.</p> <p>Protect water intakes.</p>			
Fire	<p>FLAMMABLE.</p> <p>Flashback along vapor trail may occur.</p> <p>Vapor may explode if ignited in an enclosed area.</p> <p>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</p> <p>Extinguish with dry chemical, foam, or carbon dioxide.</p> <p>Water may be ineffective on fire.</p> <p>Cool exposed containers with water.</p>		
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR</p> <p>Irritating to eyes, nose and throat.</p> <p>If inhaled, will cause dizziness or difficult breathing.</p> <p>Move to fresh air.</p> <p>If breathing has stopped, give artificial respiration.</p> <p>If breathing is difficult, give oxygen.</p> <p>LIQUID</p> <p>Will burn skin and eyes.</p> <p>Harmful if swallowed.</p> <p>Remove contaminated clothing and shoes.</p> <p>Flush affected areas with plenty of water.</p> <p>IF IN EYES, hold eyelids open and flush with plenty of water.</p> <p>IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p> <p>DO NOT INDUCE VOMITING.</p>		
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</p> <p>Fouling to shoreline.</p> <p>May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials.</p> <p>Notify operators of nearby water intakes.</p>		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 32; Aromatic Hydrocarbon  
2.2 Formula:  $C_6H_5CH_2CH_3$   
2.3 IMO/UN Designation: 3.3/1175  
2.4 DOT ID No.: 1175  
2.5 CAS Registry No.: 100-41-4  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51126

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Self-contained breathing apparatus; safety goggles.  
3.2 Symptoms Following Exposure: Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters.  
3.3 Treatment of Exposure: INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration. INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis. SKIN AND EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.  
3.4 TLV-TWA: 100 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 125 ppm  
3.7 Toxicity by Ingestion: Grade 2;  $LD_{50} = 0.5$  to  $5$  g/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
3.12 Odor Threshold: 140 ppm  
3.13 IDLH Value: 800 ppm  
3.14 OSHA PEL-TWA: 100 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point:  $80^{\circ}F$  O.C.  $59^{\circ}F$  C.C.  
4.2 Flammable Limits in Air: 1.0%-6.7%  
4.3 Fire Extinguishing Agents: Foam (most effective), water fog, carbon dioxide or dry chemical.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Irritating vapors are generated when heated.  
4.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back.  
4.7 Auto Ignition Temperature:  $860^{\circ}F$   
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: 5.8 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 50.0 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 13.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC):  $N_2$  diluent: 9.0%

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: 29 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 2.8% (theor.), 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Research grade: 99.98%; pure grade: 99.5%; technical grade: 99.0%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester) or pressure-vacuum  
7.5 IMO Pollution Category: B  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at  $15^{\circ}C$  and 1 atm: Liquid  
9.2 Molecular Weight: 106.17  
9.3 Boiling Point at 1 atm:  $277.2^{\circ}F = 136.2^{\circ}C = 409.4^{\circ}K$   
9.4 Freezing Point:  $-139^{\circ}F = -95^{\circ}C = 178^{\circ}K$   
9.5 Critical Temperature:  $651.0^{\circ}F = 343.9^{\circ}C = 617.1^{\circ}K$   
9.6 Critical Pressure: 523 psia = 35.6 atm = 3.61 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.867 at  $20^{\circ}C$  (liquid)  
9.8 Liquid Surface Tension: 29.2 dynes/cm = 0.0292 N/m at  $20^{\circ}C$   
9.9 Liquid Water Interfacial Tension: 35.48 dynes/cm = 0.03548 N/m at  $20^{\circ}C$   
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.071  
9.12 Latent Heat of Vaporization: 144 Btu/lb = 80.1 cal/g =  $3.35 \times 10^5$  J/kg  
9.13 Heat of Combustion:  $-17,780$  Btu/lb =  $-9877$  cal/g =  $-413.5 \times 10^5$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.4 psia

### NOTES

# ETHYLBENZENE

ETB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	54.990	40	0.402	-90	1.065	40	0.835
50	54.680	50	0.404	-80	1.056	50	0.774
60	54.370	60	0.407	-70	1.047	60	0.719
70	54.060	70	0.409	-60	1.037	70	0.670
80	53.750	80	0.412	-50	1.028	80	0.626
90	53.430	90	0.414	-40	1.018	90	0.586
100	53.120	100	0.417	-30	1.009	100	0.550
110	52.810	110	0.419	-20	1.000	110	0.518
120	52.500	120	0.421	-10	0.990	120	0.488
130	52.190	130	0.424	0	0.981	130	0.461
140	51.870	140	0.426	10	0.971	140	0.436
150	51.560	150	0.429	20	0.962	150	0.414
160	51.250	160	0.431	30	0.953	160	0.393
170	50.940	170	0.434	40	0.943	170	0.374
180	50.620	180	0.436	50	0.934	180	0.356
190	50.310	190	0.439	60	0.924	190	0.340
200	50.000	200	0.441	70	0.915	200	0.325
210	49.690	210	0.443	80	0.906	210	0.311
				90	0.896		
				100	0.887		
				110	0.877		
				120	0.868		
				130	0.859		
				140	0.849		
				150	0.840		
				160	0.830		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.020	80	0.202	80	0.00370	-400	-0.007
		100	0.370	100	0.00654	-350	0.026
		120	0.644	120	0.01099	-300	0.060
		140	1.071	140	0.01767	-250	0.093
		160	1.713	160	0.02734	-200	0.125
		180	2.643	180	0.04087	-150	0.157
		200	3.953	200	0.05926	-100	0.187
		220	5.747	220	0.08363	-50	0.217
		240	8.147	240	0.11520	0	0.246
		260	11.290	260	0.15510	50	0.274
		280	15.320	280	0.20490	100	0.301
		300	20.410	300	0.26570	150	0.327
		320	26.730	320	0.33910	200	0.353
		340	34.460	340	0.42620	250	0.377
		360	43.800	360	0.52850	300	0.401
		380	54.950	380	0.64720	350	0.424
						400	0.446
						450	0.467
						500	0.487
						550	0.507
						600	0.525

# ETHYLENE CYANOHYDRIN

ETC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Cyanoethanol Glycol cyanohydrin Hydracrylonitrile 1-Hydroxy-2-cyanoethane 3-Hydroxypropanenitrile	Liquid  Colorless to yellow-brown  Weak odor to odorless  Sinks and mixes with water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Wear self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. Have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 20; Alcohol, glycol  
2.2 **Formula:** HOCH<sub>2</sub>CH<sub>2</sub>CN  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 109-78-4  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51484

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask; plastic gloves; rubber clothing; vapor- proof goggles.  
3.2 **Symptoms Following Exposure:** Liquid causes eye irritation. If swallowed, may cause severe kidney injury.  
3.3 **Treatment of Exposure:** INGESTION: induce vomiting at once and call a physician. EYES: wash with flowing water for at least 15 min. SKIN: flush exposed areas with plenty of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Ingestion of liquid may cause severe kidney damage.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 265°F O.C.  
4.2 **Flammable Limits in Air:** 2.3% (calc.)-12.1% (est.)  
4.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; alcohol- type foam for large fires.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Toxic gases are generated when heated.  
4.6 **Behavior in Fire:** Decomposes, generating toxic gases  
4.7 **Auto Ignition Temperature:** 922°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 22.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** (D)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 71.08  
9.3 **Boiling Point at 1 atm:** 445.5°F = 229.7°C = 502.9°K  
9.4 **Freezing Point:** -51.2°F = -46.2°C = 227.0°K  
9.5 **Critical Temperature:** 804.2°F = 429°C = 702.2°K  
9.6 **Critical Pressure:** 720 psia = 4.9 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.047 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Very low

### NOTES



# ETHYLENE CYANOHYDRIN

ETC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	66.280	50	0.573		N O T		N O T
50	65.959	55	0.573				
60	65.629	60	0.573				
70	65.299	65	0.573				
80	64.980	70	0.573		P		P
90	64.650	75	0.573		E		E
100	64.330	80	0.573		R		R
110	64.000	85	0.573		T		T
120	63.670	90	0.573		I		I
130	63.350	95	0.573		N		N
140	63.020	100	0.573		E		E
150	62.700	105	0.573		N		N
160	62.370	110	0.573		T		T
170	62.040	115	0.573				
180	61.720	120	0.573				
190	61.390						
200	61.070						
210	60.740						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	100	0.003	100	0.00004		N
	I	120	0.007	120	0.00007		O
	S	140	0.013	140	0.00015		T
	C	160	0.026	160	0.00028		
	I	180	0.049	180	0.00051		P
	B	200	0.088	200	0.00089		E
	L	220	0.154	220	0.00150		R
	E	240	0.259	240	0.00245		T
		260	0.425	260	0.00391		I
		280	0.677	280	0.00606		N
		300	1.055	300	0.00919		E
		320	1.605	320	0.01363		R
		340	2.391	340	0.01980		T
		360	3.495	360	0.02823		I
		380	5.016	380	0.03955		N
		400	7.079	400	0.05452		E
		420	9.835	420	0.07403		N
		440	13.470	440	0.09911		T

# ETHOXYLATED TRIDECANOL

ETD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethoxylated tridecyl alcohol Poly(oxyethyl) tridecyl ether Tergitol nonionic 3-A-6		Liquid	Colorless to yellow	Pleasant odor
Avoid contact with liquid. Call fire department. Notify local health and pollution agencies. Protect water intakes.				
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin. Will burn eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 20; Alcohol, glycol
- 2.2 **Formula:**  $C_{13}H_{27}O(CH_2CH_2O)_nCH_2CH_2OH$   
where  $n = 5$  (average)
- 2.3 **IMO/UN Designation:** Not listed
- 2.4 **DOT ID No.:** Not listed
- 2.5 **CAS Registry No.:** Currently not available
- 2.6 **NAERG Guide No.:** Not listed
- 2.7 **Standard Industrial Trade Classification:** 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Plastic gloves; goggles.
- 3.2 **Symptoms Following Exposure:** Liquid causes eye injury and de-fats the skin, causing irritation.
- 3.3 **Treatment of Exposure:** In case of contact with eyes, immediately flush with plenty of water for at least 15 min.; get medical attention.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5$  to  $5$  g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** None
- 3.11 **Liquid or Solid Characteristics:** Liquid causes eye injury. Contact with skin may cause irritation.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 385°F O.C.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; alcohol foam and water for large fires.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Usually 100%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 464
- 9.3 **Boiling Point at 1 atm:** Very high
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.00 at 15°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.)  $-11,000$  Btu/lb=  
 $-6,200$  cal/g =  $-260 \times 10^3$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.)  $-9 = -5$  cal/g =  $-0.2 \times 10^3$  J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHOXYLATED TRIDECANOL

ETD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	62.700	68	0.478		N		N
61	62.670	69	0.478		O		O
62	62.630	70	0.478		T		T
63	62.600	71	0.478				
64	62.560	72	0.478		P		P
65	62.530	73	0.478		E		E
66	62.490	74	0.478		R		R
67	62.460	75	0.478		T		T
68	62.420	76	0.478		I		I
69	62.390	77	0.478		N		N
70	62.350	78	0.478		E		E
71	62.320	79	0.478		N		N
72	62.280	80	0.478		T		T
73	62.250	81	0.478				
74	62.210	82	0.478				
75	62.180	83	0.478				
76	62.150	84	0.478				
77	62.110	85	0.478				
78	62.080						
79	62.040						
80	62.010						
81	61.970						
82	61.940						
83	61.900						
84	61.870						
85	61.830						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	10.000		N		N		N
			O		O		O
			T		T		T
			P		P		P
			E		E		E
			R		R		R
			T		T		T
			I		I		I
			N		N		N
			E		E		E
			N		N		N
			T		T		T

# 2-ETHYL TOLUENE

ETE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Ethyl-2-methylbenzene o-Ethylmethylbenzene o-Ethyltoluene o-Methylethylbenzene	Watery liquid  Colorless  Pleasant odor  Floats on water. Flammable, irritating vapor is produced.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Avoid inhalation.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	COMBUSTIBLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective on fire. Wear goggles and self contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 32; Aromatic hydrocarbon  
2.2 **Formula:** o-CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>C<sub>2</sub>H<sub>5</sub>  
2.3 **IMO/UN Designation:** Not Listed  
2.4 **DOT ID No.:** Not Listed  
2.5 **CAS Registry No.:** 611-14-3  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask; goggles or face shield; plastic gloves.  
3.2 **Symptoms Following Exposure:** Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration.  
3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: Do NOT induce vomiting; call a doctor. EYES: Flush with water for at least 15 min. SKIN: Wipe off, wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Kidney and liver damage may follow ingestion.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 103°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires. Alcohol or foam for large fires  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 824°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research, reagent, 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** (B)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not Pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	-
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 120.19  
9.3 **Boiling Point at 1 atm:** 329.4°F = 165.2°C = 438.4°K  
9.4 **Freezing Point:** -113.4°F = -80.8°C = 192.4°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.8807 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 15.2 dyne/cm = 0.0152 N/m @ 161°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.15  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 200 Btu/lb = 111 cal/g = 4.6 x 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -18,650 Btu/lb = -10,361 cal/g = -434 x 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** (est) -19,998 Btu/lb = -11,110 cal/g = -465 X 10<sup>3</sup> J/kg  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.2 psia

### NOTES

# 2-ETHYL TOLUENE

ETE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	54.980	260	0.403		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	60 80 100 120 140 160 180 200 220 240 260 280 300 320	0.028 0.077 0.167 0.315 0.538 0.855 1.288 1.857 2.585 3.497 4.618 5.974 7.591 9.498		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.268 0.281 0.293 0.305 0.317 0.329 0.342 0.354 0.366 0.378 0.390 0.403 0.415 0.427 0.439 0.451 0.464 0.476 0.488 0.500 0.512 0.525 0.537 0.549 0.561

# ETHOXY TRIGLYCOL

ETG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dowanol TE Triethoxytriethylene glycol Triethylene glycol monoethyl ether Triglycol monoethyl ether	Liquid	Colorless	Odorless
Sinks and mixes with water.			
<b>Keep people away.</b> <b>Shut off ignitions sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water and foam may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	Not harmful.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 40; Glycol ether  
2.2 Formula:  $C_8H_{18}O(CH_2)_2O(CH_2)_2OCH_2CH_2OH$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 112-50-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Chemical safety goggles and adequate protective clothing.  
3.2 Symptoms Following Exposure: No appreciable hazard in ordinary handling or use.  
3.3 Treatment of Exposure: Wash affected parts with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 1;  $LD_{50}$  = 5 to 15 g/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat.  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 275°F O.C.  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, or alcohol foam  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 50.0 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 17.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 178  
9.3 Boiling Point at 1 atm: 493°F = 256°C = 529°K  
9.4 Freezing Point: -1.7°F = -18.7°C = 254.5°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.020 at 20°C (liquid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.033  
9.12 Latent Heat of Vaporization: (est.) 125 Btu/lb = 69 cal/g =  $2.9 \times 10^5$  J/kg  
9.13 Heat of Combustion: (est.) = -11,000 Btu/lb = -6,170 cal/g =  $-258 \times 10^5$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Very low

NOTES

# ETHOXY TRIGLYCOL

ETG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	64.849		C		N		N
36	64.780		U		O		O
38	64.709		R		T		T
40	64.639		R				
42	64.570		E		P		P
44	64.500		N		E		E
46	64.429		T		R		R
48	64.360		L		T		T
50	64.299		Y		I		I
52	64.230				N		N
54	64.160		N		E		E
56	64.089		O		N		N
58	64.020		T				
60	63.950		A				
62	63.880		V				
64	63.810		A				
66	63.740		I				
68	63.670		L				
70	63.600		A				
72	63.530		B				
74	63.460		L				
76	63.390		E				
78	63.320						
80	63.260						
82	63.190						
84	63.120						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	140	0.002	140	0.00006	90	0.224
	I	160	0.005	160	0.00014	100	0.224
	S	180	0.012	180	0.00031	110	0.224
	C	200	0.025	200	0.00064	120	0.224
	I	220	0.050	220	0.00122	130	0.224
	B	240	0.094	240	0.00222	140	0.224
	L	260	0.167	260	0.00385	150	0.224
	E	280	0.285	280	0.00639	160	0.224
		300	0.469	300	0.01024	170	0.224
		320	0.746	320	0.01586	180	0.224
		340	1.149	340	0.02383	190	0.224
		360	1.723	360	0.03485	200	0.224
		380	2.518	380	0.04973	210	0.224
		400	3.598	400	0.06940	220	0.224
		420	5.035	420	0.09490	230	0.224
		440	6.911	440	0.12740	240	0.224
		460	9.322	460	0.16810	250	0.224
		480	12.370	480	0.21840	260	0.224
		500	16.180	500	0.27960		
		520	20.880	520	0.35330		
		540	26.590	540	0.44100		
		560	33.470	560	0.54430		

# ETHANE

ETH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methylmethane	Liquefied compressed gas	Colorless	Mild gasoline-like odor
Floats and boils on water. Flammable visible vapor cloud is produced.			
<div>Evacuate.</div> <div>Keep people away.</div> <div>Shut off ignition sources and call fire department.</div> <div>Stay upwind and use water spray to "knock down" vapor.</div> <div>Avoid contact with liquid.</div> <div>Notify local health and pollution control agencies.</div>			
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water. Let fire burn.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR If inhaled will cause difficult breathing. Not irritating to eyes, nose or throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.		
<b>Water Pollution</b>	Not harmful.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 31; Paraffin  
 2.2 Formula: C<sub>2</sub>H<sub>6</sub>  
 2.3 IMO/UN Designation: 2.0/1035 (Compressed) 2.0/1961 (Refrigerated)  
 2.4 DOT ID No.: 1035 (Compressed) 1961 (Refrigerated)  
 2.5 CAS Registry No.: 74-84-0  
 2.6 NAERG Guide No.: 115  
 2.7 Standard Industrial Trade Classification: 51114

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Self-contained breathing apparatus for high vapor concentrations.  
 3.2 Symptoms Following Exposure: In high vapor concentrations, can act as simple asphyxiant. Liquid causes severe frostbite.  
 3.3 Treatment of Exposure: Remove from exposure; support respiration.  
 3.4 TLV-TWA: Not listed.  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 Toxicity by Ingestion: Not pertinent  
 3.8 Toxicity by Inhalation: Currently not available.  
 3.9 Chronic Toxicity: None  
 3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat.  
 3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly.  
 3.12 Odor Threshold: 899 ppm  
 3.13 IDLH Value: Not listed.  
 3.14 OSHA PEL-TWA: Not listed.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: -211°F  
 4.2 Flammable Limits in Air: 2.9%-13.0%  
 4.3 Fire Extinguishing Agents: Stop flow of gas  
 4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
 4.5 Special Hazards of Combustion Products: Not pertinent  
 4.6 Behavior in Fire: Not pertinent  
 4.7 Auto Ignition Temperature: 940°F  
 4.8 Electrical Hazards: Class I, group D  
 4.9 Burning Rate: 7.3 mm/min.  
 4.10 Adiabatic Flame Temperature: 2394. (Est.)  
 4.11 Stoichiometric Air to Fuel Ratio: 16.7 (calc.)  
 4.12 Flame Temperature: Currently not available  
 4.13 Combustion Molar Ratio (Reactant to Product): 5.0 (calc.)  
 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
 5.2 Reactivity with Common Materials: No reaction  
 5.3 Stability During Transport: Stable  
 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
 5.5 Polymerization: Not pertinent  
 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: None  
 6.2 Waterfowl Toxicity: None  
 6.3 Biological Oxygen Demand (BOD): None  
 6.4 Food Chain Concentration Potential: None  
 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Research; pure  
 7.2 Storage Temperature: -128°F  
 7.3 Inert Atmosphere: No requirement  
 7.4 Venting: Safety relief  
 7.5 IMO Pollution Category: Currently not available  
 7.6 Ship Type: 2  
 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable gas  
 8.2 49 CFR Class: 2.1  
 8.3 49 CFR Package Group: Not pertinent.  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0

 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Gas  
 9.2 Molecular Weight: 30.07  
 9.3 Boiling Point at 1 atm: -127.5°F = -88.6°C = 264.6°K  
 9.4 Freezing Point: -279.9°F = -183.3°C = 89.9°K  
 9.5 Critical Temperature: 90.1°F = 32.3°C = 305.5°K  
 9.6 Critical Pressure: 708.0 psia = 48.16 atm = 4.879 MN/m<sup>2</sup>  
 9.7 Specific Gravity: 0.546 at -88.6°C (liquid)  
 9.8 Liquid Surface Tension: 16 dynes/cm = 0.016 N/m at -88°C  
 9.9 Liquid Water Interfacial Tension: (est.) 45 dynes/cm = 0.045 N/m at -88°C  
 9.10 Vapor (Gas) Specific Gravity: 1.1  
 9.11 Ratio of Specific Heats of Vapor (Gas): 1.191  
 9.12 Latent Heat of Vaporization: 211 Btu/lb = 117 cal/g = 4.90 X 10<sup>5</sup> J/kg  
 9.13 Heat of Combustion: -20,293 Btu/lb = -11,274 cal/g = -472.02 X 10<sup>3</sup> J/kg  
 9.14 Heat of Decomposition: Not pertinent  
 9.15 Heat of Solution: Not pertinent  
 9.16 Heat of Polymerization: Not pertinent  
 9.17 Heat of Fusion: 22.73 cal/g  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: Very high

### NOTES



# ETHANE

ETH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-145	34.760	-270	0.546		N O T		C U R R E N T L Y
-140	34.530	-260	0.549				N O T
-135	34.310	-250	0.552		P E R T I N E N T		A V A I L A B L E
-130	34.080	-240	0.554				
		-230	0.557				
		-220	0.560				
		-210	0.563				
		-200	0.565				
		-190	0.568				
		-180	0.571				
		-170	0.574				
		-160	0.577				
		-150	0.579				
		-140	0.582				
		-130	0.585				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	N O T	-165	4.090	-165	0.03888	0	0.378
		-160	4.934	-160	0.04612	25	0.390
		-155	5.916	-155	0.05439	50	0.403
		-150	7.051	-150	0.06379	75	0.415
	P E R T I N E N T	-145	8.359	-145	0.07441	100	0.428
		-140	9.856	-140	0.08636	125	0.440
		-135	11.560	-135	0.09976	150	0.453
		-130	13.500	-130	0.11470	175	0.465
		-125	15.690	-125	0.13130	200	0.477
		-120	18.150	-120	0.14970	225	0.490
		-115	20.910	-115	0.16990	250	0.502
		-110	23.990	-110	0.19220	275	0.515
		-105	27.420	-105	0.21660	300	0.527
		-100	31.220	-100	0.24320	325	0.540
		-95	35.430	-95	0.27210	350	0.552
		-90	40.060	-90	0.30360	375	0.564
		-85	45.150	-85	0.33760	400	0.577
		-80	50.730	-80	0.37430	425	0.589
		-75	56.830	-75	0.41380	450	0.602
		-70	63.470	-70	0.45630	475	0.614
		-65	70.690	-65	0.50180	500	0.627
		-60	78.530	-60	0.55040	525	0.639
						550	0.651
						575	0.664
						600	0.676

# ETHYLENEIMINE

ETI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Azirane Aziridine		Oily liquid Colorless Ammonia odor
Floats and mixes with water. Poisonous, flammable vapor is produced.		
Evacuate. Keep people away. <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	<b>FLAMMABLE.</b> Containers may explode when heated. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from behind barrier. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b> <b>VAPOR</b> <b>POISONOUS IF INHALED OR IF SKIN IS EXPOSED.</b> Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. <b>LIQUID</b> <b>POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.</b> Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:** CH<sub>2</sub>CH<sub>2</sub>NH
- 2.3 **IMO/UN Designation:** 3.2/1185
- 2.4 **DOT ID No.:** 1185
- 2.5 **CAS Registry No.:** 151-56-4
- 2.6 **NAERG Guide No.:** 131P
- 2.7 **Standard Industrial Trade Classification:** 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** If exposure is possible, wear full protective clothing (neoprene slicker suit, rubber boots, rubber gloves, chemical goggles). If vapors may be present, wear all-purpose canister or gas mask; if vapors are known to be present, use self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** Material gives inadequate warning of overexposure by respiration or skin contact. May cause nausea, vomiting, and possibly death when inhaled, ingested, or absorbed through skin. Severe blistering agent; can produce third-degree chemical burns of skin. Has corrosive effect on mucous membranes and may cause scarring of esophagus if swallowed. Corrosive to eye tissue; may cause permanent corneal opacity and conjunctival scarring. Effects on eye tissue, mucous membrane, and skin may be delayed.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure and administer oxygen; steroid therapy (by physician) is recommended. SKIN OR EYES: prompt and adequate irrigation with water (within 60 seconds of exposure) can prevent serious injury.
- 3.4 **TLV-TWA:** 0.5 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> below 50 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes cancer in mice. Effects on man unknown.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 100 ppm
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 1°F O.C.  
: 12°F C.C.
- 4.2 **Flammable Limits in Air:** 3.3%-54.8%
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors generated when heated.
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. May polymerize in fires with evolution of heat and container rupture.
- 4.7 **Auto Ignition Temperature:** 608°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 20.2 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 5.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Mild reaction, non-hazardous
- 5.2 **Reactivity with Common Materials:** Contact with silver or aluminum may cause polymerization.
- 5.3 **Stability During Transport:** Stable unless heated under pressure.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
- 5.5 **Polymerization:** Explosive polymerization can occur when in contact with acids.
- 5.6 **Inhibitor of Polymerization:** None used

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.0%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Inert
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	3
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** P054
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 43.07
- 9.3 **Boiling Point at 1 atm:** 133°F = 56°C = 329°K
- 9.4 **Freezing Point:** -108°F = -78°C = 195°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.832 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 34.5 dynes/cm = 0.0345 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 1.5
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.192
- 9.12 **Latent Heat of Vaporization:** 333 Btu/lb = 185 cal/g = 7.75 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -15,930 Btu/lb = -8850 cal/g = -370.5 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) -26 Btu/lb = -14 cal/g = -0.6 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** (est.) -900 Btu/lb = -500 cal/g = -20 X 10<sup>5</sup> J/kg
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 8.6 psia

### NOTES

# ETHYLENEIMINE

ETI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	54.060	20	0.563		N		N
10	53.750	30	0.569		O		O
20	53.430	40	0.575		T		T
30	53.120	50	0.581				
40	52.810	60	0.587		P		P
50	52.500	70	0.593		E		E
60	52.190	80	0.599		R		R
70	51.870	90	0.605		T		T
80	51.561	100	0.611		I		I
90	51.250	110	0.618		N		N
100	50.940	120	0.624		E		E
110	50.620	130	0.630		N		N
120	50.310				T		T
130	50.000						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	-20	0.143	-20	0.00131	0	0.246
	I	-10	0.220	-10	0.00196	25	0.261
	S	0	0.330	0	0.00288	50	0.276
	C	10	0.483	10	0.00413	75	0.290
	I	20	0.693	20	0.00580	100	0.305
	B	30	0.976	30	0.00799	125	0.319
	L	40	1.349	40	0.01083	150	0.333
	E	50	1.835	50	0.01444	175	0.346
		60	2.458	60	0.01897	200	0.360
		70	3.246	70	0.02459	225	0.373
		80	4.232	80	0.03147	250	0.386
		90	5.451	90	0.03979	275	0.399
		100	6.942	100	0.04976	300	0.411
		110	8.747	110	0.06160	325	0.423
		120	10.910	120	0.07553	350	0.435
		130	13.490	130	0.09177	375	0.447
		140	16.530	140	0.11060	400	0.459
		150	20.080	150	0.13220	425	0.470
		160	24.220	160	0.15680	450	0.481
		170	29.000	170	0.18480	475	0.492
		180	34.480	180	0.21630	500	0.503
		190	40.740	190	0.25160	525	0.513
		200	47.840	200	0.29100	550	0.523
		210	55.850	210	0.33460	575	0.533
						600	0.543

# ETHYLENE

ETL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethene Olefiant gas	Liquefied compressed gas Colorless Sweet odor  Floats and boils on water. Flammable visible vapor cloud is produced.
Evacuate. Keep people away. Avoid inhalation. Wear self-contained breathing apparatus. Shut off ignition sources and call fire department. Avoid contact with liquid. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. May explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Stop flow of gas if possible. Cool exposed containers and men effecting shutoff with water. Let fire burn.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Not irritating to eyes, nose or throat. If inhaled, will cause headache, dizziness, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Will cause frostbite. Flush affected areas with plenty of water. <b>DO NOT RUB AFFECTED AREAS.</b>
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 30; Olefin
- 2.2 Formula: C<sub>2</sub>H<sub>4</sub>
- 2.3 IMO/UN Designation: 2.0/1962 (compressed); 2.0/1038 (liquefied)
- 2.4 DOT ID No.: 1962 (compressed); 1038 (liquefied)
- 2.5 CAS Registry No.: 74-85-1
- 2.6 NAERG Guide No.: 116P (compressed); 115 (liquid)
- 2.7 Standard Industrial Trade Classification: 51111

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor canister or air-supplied mask.
- 3.2 **Symptoms Following Exposure:** Moderate concentration in air causes drowsiness, dizziness, and unconsciousness. Overexposure causes headache, drowsiness, muscular weakness.
- 3.3 **Treatment of Exposure:** Remove victim to fresh air, give artificial respiration and oxygen if breathing has stopped, and call a physician.
- 3.4 **TLV-TWA:** Simple asphyxiant.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin, but may cause frostbite.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -213°F (approx.) C.C.
- 4.2 **Flammable Limits in Air:** 2.75%-28.6%
- 4.3 **Fire Extinguishing Agents:** Stop flow of gas if possible. Use carbon dioxide, dry chemical, water fog.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Vapors are anesthetic.
- 4.6 **Behavior in Fire:** Container may explode.
- 4.7 **Auto Ignition Temperature:** 842°F
- 4.8 **Electrical Hazards:** Class I, group C
- 4.9 **Burning Rate:** 7.4 mm/min.
- 4.10 **Adiabatic Flame Temperature:** 2600. (Est.)
- 4.11 **Stoichiometric Air to Fuel Ratio:** 14.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 4.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 10.0%; CO<sub>2</sub> diluent: 11.5%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 22 ppm/1 hr/sunfish/killed/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99-100%
- 7.2 **Storage Temperature:** Ambient (gas); -155°F (liquid)
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2.1
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

<b>Category</b>	<b>Classification</b>
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	2
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 28.05
- 9.3 **Boiling Point at 1 atm:** -154.7°F = -103.7°C = 169.5°K
- 9.4 **Freezing Point:** -272.4°F = -169.1°C = 104.1°K
- 9.5 **Critical Temperature:** 49.8°F = 9.9°C = 283.1°K
- 9.6 **Critical Pressure:** 742 psia = 50.5 atm = 5.11 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.569 at -103.8°C (liquid)
- 9.8 **Liquid Surface Tension:** 16 dynes/cm = 0.016 N/m at -104°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at -104°C
- 9.10 **Vapor (Gas) Specific Gravity:** 1.0
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.240
- 9.12 **Latent Heat of Vaporization:** 207.7 Btu/lb = 115.4 cal/g = 4.832 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -20,290 Btu/lb = -11,272 cal/g = -471.94 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYLENE

ETL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-165	36.090	-215	0.597		N	-165	0.199
-160	35.810	-210	0.601		O	-160	0.190
-155	35.530	-205	0.604		T	-155	0.181
		-200	0.607				
		-195	0.611		P		
		-190	0.614		E		
		-185	0.617		R		
		-180	0.621		T		
		-175	0.624		I		
		-170	0.627		N		
		-165	0.631		E		
		-160	0.634		N		
		-155	0.637		T		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	N	-250	0.121	-250	0.00151	0	0.332
	O	-240	0.252	-240	0.00300	25	0.344
	T	-230	0.488	-230	0.00555	50	0.357
		-220	0.884	-220	0.00964	75	0.369
	P	-210	1.517	-210	0.01588	100	0.381
	E	-200	2.482	-200	0.02497	125	0.394
	R	-190	3.895	-190	0.03774	150	0.406
	T	-180	5.894	-180	0.05507	175	0.417
	I	-170	8.637	-170	0.07791	200	0.429
	N	-160	12.300	-160	0.10720	225	0.441
	E	-150	17.070	-150	0.14400	250	0.452
	N	-140	23.160	-140	0.18930	275	0.464
	T	-130	30.780	-130	0.24400	300	0.475
		-120	40.160	-120	0.30890	325	0.486
		-110	51.520	-110	0.38500	350	0.497
		-100	65.099	-100	0.47300	375	0.508
						400	0.519
						425	0.529
						450	0.540
						475	0.550
						500	0.560
						525	0.571
						550	0.581
						575	0.591
						600	0.600

# ETHYL METHACRYLATE

ETM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethyl 2-methacrylate Ethyl methacrylate-inhibited Ethyl alpha-methylmethacrylate Ethyl 2-methyl-2-propenoate Methacrylic acid, ethyl ester	Liquid  Colorless  Sharp unpleasant odor  Floats on water.
Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE: Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 14; Acrylate  
2.2 Formula:  $\text{CH}_2 = \text{C}(\text{CH}_3)\text{COOC}_2\text{H}_5$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2277  
2.5 CAS Registry No.: 97-63-2  
2.6 NAERG Guide No.: 129P  
2.7 Standard Industrial Trade Classification: 51373

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Impervious gloves; splash goggles; self-contained breathing apparatus if exposed to vapors; coveralls
- 3.2 **Symptoms Following Exposure:** Inhalation may cause irritation of the mucous membrane. Ingestion causes irritation of mouth and stomach. Contact with liquid irritates eyes and skin.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; apply artificial respiration and oxygen if indicated. INGESTION: induce vomiting; call a physician. EYES: wash with copious quantities of water for 15 min.; call a physician. SKIN: flush with water; wash with soap and water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 4 \text{ g/kg}$  (rabbit)  
3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes birth defects in experimental animals
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 85°F O.C. 80°F C.C.  
4.2 **Flammable Limits in Air:** 1.8%(LFL)  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Sealed containers may rupture explosively if hot. Heat can cause a violent polymerization reaction with rapid release of energy. Vapors are heavier than air and can travel to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 740°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 4.56 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** If proper concentration of inhibitor is not present or when material is hot, a violent polymerization reaction may occur.  
5.6 **Inhibitor of Polymerization:** Oxygen in the air inhibits polymerization.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Below 38°C (100°F)  
7.3 **Inert Atmosphere:** Ventilated (natural)  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** (D)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: U118  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 114  
9.3 **Boiling Point at 1 atm:** 243°F = 117°C = 390°K  
9.4 **Freezing Point:** <-58°F = <-50°C = <223°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.9151 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.9  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.064  
9.12 **Latent Heat of Vaporization:** 170 Btu/lb = 96 cal/g =  $4.0 \times 10^5 \text{ J/kg}$   
9.13 **Heat of Combustion:** -12,670 Btu/lb = -7,040 cal/g =  $-294 \times 10^5 \text{ J/kg}$   
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** -218 Btu/lb = -121 cal/g =  $-5.06 \times 10^5 \text{ J/kg}$   
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.77 psia

### NOTES

# ETHYL METHACRYLATE

ETM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	57.960	60	0.450	52	1.048	60	1.001
44	57.890	61	0.450	54	1.048	61	0.992
46	57.820	62	0.450	56	1.048	62	0.984
48	57.750	63	0.450	58	1.048	63	0.975
50	57.680	64	0.450	60	1.048	64	0.967
52	57.610	65	0.450	62	1.048	65	0.959
54	57.540	66	0.450	64	1.048	66	0.951
56	57.470	67	0.450	66	1.048	67	0.943
58	57.400	68	0.450	68	1.048	68	0.935
60	57.330	69	0.450	70	1.048	69	0.927
62	57.260	70	0.450	72	1.048	70	0.919
64	57.190	71	0.450	74	1.048	71	0.912
66	57.120	72	0.450	76	1.048	72	0.904
68	57.050	73	0.450	78	1.048	73	0.897
70	56.980	74	0.450	80	1.048	74	0.889
72	56.920	75	0.450	82	1.048	75	0.882
74	56.850	76	0.450	84	1.048	76	0.875
76	56.780	77	0.450	86	1.048	77	0.868
		78	0.450			78	0.861
		79	0.450			79	0.854
		80	0.450			80	0.847
		81	0.450			81	0.840
		82	0.450			82	0.834
		83	0.450			83	0.827
		84	0.450			84	0.820
		85	0.450			85	0.814

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	0.227	60	0.00464	0	0.261
	N	70	0.307	70	0.00617	20	0.270
	S	80	0.412	80	0.00810	40	0.278
	O	90	0.545	90	0.01053	60	0.287
	L	100	0.714	100	0.01356	80	0.295
	U	110	0.928	110	0.01730	100	0.303
	B	120	1.194	120	0.02188	120	0.311
	L	130	1.524	130	0.02744	140	0.319
	E	140	1.928	140	0.03415	160	0.327
		150	2.422	150	0.04219	180	0.335
		160	3.019	160	0.05174	200	0.343
		170	3.738	170	0.06304	220	0.350
		180	4.597	180	0.07631	240	0.358
		190	5.617	190	0.09181	260	0.365
		200	6.822	200	0.10980	280	0.372
		210	8.237	210	0.13060	300	0.379
		220	9.891	220	0.15460	320	0.387
		230	11.810	230	0.18190	340	0.393
		240	14.040	240	0.21310	360	0.400
						380	0.407
						400	0.414
						420	0.420
						440	0.427
						460	0.433
						480	0.440
						500	0.446

# ETHYL NITRITE

ETN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nitrous ether Spirit of ether nitrite Sweet spirit of nitre	Liquid  Colorless to light yellow  Pleasant odor  Floats on water. May boil on water. Boiling point is 63°F.
Evacuate. Keep people away. Avoid inhalation. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Combat fires from safe distance or protected location. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR If inhaled will cause headache, dizziness, or loss of consciousness. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID If swallowed will cause headache, or loss of consciousness. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>2</sub>H<sub>5</sub>ONO  
2.3 IMO/UN Designation: 3.1/1194  
2.4 DOT ID No.: 1194  
2.5 CAS Registry No.: 109-95-5  
2.6 NAERG Guide No.: 131  
2.7 Standard Industrial Trade Classification: 51140

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, increased pulse rate, decreased blood pressure, and unconsciousness. Contact with liquid irritates eyes and skin.  
3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; if breathing has stopped, give artificial respiration; call physician. EYES: flush with water for at least 15 min.; get medical attention if irritation persists. SKIN: flush with water, wash with soap and water. INGESTION: do NOT induce vomiting; call physician.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
-31°F C.C.  
4.2 **Flammable Limits in Air:** 3%->50%  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen are generated.  
4.6 **Behavior in Fire:** Vapors are heavier than air and may travel a considerable distance to a source of ignition and flash back; can decompose violently above 194°F; containers may explode in a fire.  
4.7 **Auto Ignition Temperature:** 194°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 2.6 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 15.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 5.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable if stored in a cool place and not exposed to strong light.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: -  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Often shipped as a 85-92% (by volume) solution in ethyl alcohol. Properties very similar.  
7.2 **Storage Temperature:** Cool ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	4

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 75.1  
9.3 **Boiling Point at 1 atm:** 63°F = 17°C = 290°K  
9.4 **Freezing Point:** -58°F = -50°C = 223°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.900 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 35 dynes/cm = 0.035 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 2.6  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available  
9.12 **Latent Heat of Vaporization:** 229 Btu/lb = 127 cal/g = 5.32 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -7,800 Btu/lb = -4,300 cal/g = -180 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ETHYL NITRITE

ETN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	57.050	51	0.501	51	1.129	51	4.064
36	56.980	52	0.501	52	1.129	52	4.005
38	56.910	53	0.502	53	1.129	53	3.948
40	56.840	54	0.502	54	1.129	54	3.892
42	56.770	55	0.503	55	1.129	55	3.836
44	56.700	56	0.503	56	1.129	56	3.782
46	56.630	57	0.504	57	1.129	57	3.729
48	56.560	58	0.504	58	1.129	58	3.677
50	56.491	59	0.505	59	1.129	59	3.625
52	56.420	60	0.506	60	1.129	60	3.575
54	56.350	61	0.506	61	1.129	61	3.525
56	56.280	62	0.507	62	1.129	62	3.476
58	56.210	63	0.507	63	1.129	63	3.428
60	56.150						
62	56.080						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	34	5.598	34	0.07933		N
	N	36	6.007	36	0.08479		O
	S	38	6.443	38	0.09057		T
	O	40	6.906	40	0.09669		
	L	42	7.398	42	0.10320		P
	U	44	7.921	44	0.11000		E
	B	46	8.477	46	0.11730		R
	I	48	9.066	48	0.12490		T
	E	50	9.691	50	0.13300		I
		52	10.350	52	0.14160		N
		54	11.060	54	0.15060		E
		56	11.800	56	0.16010		N
		58	12.590	58	0.17020		T
		60	13.420	60	0.18070		
		62	14.310	62	0.19190		
		64	15.240	64	0.20360		
		66	16.230	66	0.21600		
		68	17.270	68	0.22890		

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diethion NIA 12 40 Nialate	Liquid  Clear to amber  Mild dithiophosphate acid (technical grade). Pure is odorless.  Sinks and mixes slowly with water.
<b>Fire</b> Not flammable. May decompose rapidly with violence above 150°C. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. SPRAY POISONOUS IF INHALED. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $C_4H_{10}O_4P_2S_4$ 2.3 IMO/UN Designation: 6.1/2783(>2.5%); 9/2783(<2.5%) 2.4 DOT ID No.: 2783 2.5 CAS Registry No.: 563-12-2 2.6 NAERG Guide No.: 152 2.7 Standard Industrial Trade Classification: 51631
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Wear safety glasses and gas masks. In fires full face masks of the oxygen-producing type should be worn. 3.2 <b>Symptoms Following Exposure:</b> Absorption can occur through all portals, including intact skin. Symptoms occur most rapidly after respiratory exposure or massive exposure directly to eye. Early symptoms are headache, weakness, excess perspiration, nausea, blurring of vision and tightness in the chest. Later symptoms include vomiting, abdominal cramps, muscular twitching, diarrhea, and coma. 3.3 <b>Treatment of Exposure:</b> Obtain medical aid. INHALATION: If needed, administer artificial respiration and oxygen. EYES: Irrigate with water. SKIN: Remove clothing immediately and bathe with warm water and soap. INGESTION: Gastric lavage and saline catharsis. OTHER: Give 2 to 4 mg Atropine (IV or IM). Repeat dose every 10 minutes until patient is fully atropinized. 3.4 TLV-TWA: 0.4 mg/m <sup>3</sup> (skin). 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; LD <sub>50</sub> = 50 to 500 mg/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> With chronic intoxication, minor additional exposure may lead to an acute serious episode due to asymptomatic cumulative depression of cholinesterase activity. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Spray not irritating to eyes and throat. (Vapor pressure low eliminating vapor hazard.) 3.11 <b>Liquid or Solid Characteristics:</b> No appreciable hazard. Practically harmless to the skin. 3.12 <b>Odor Threshold:</b> Pure-odorless. Emulsifiable 0.6 mg/l. 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** When heated to decomposition emits toxic fumes of oxides of sulfur and phosphorus.  
4.6 **Behavior in Fire:** Unstable at elevated temperatures. It tends to decompose rapidly with violence above 150°C.  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Not flammable  
5.3 **Stability During Transport:** Subject to slow oxidation in air.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.095 ppm/96-hour/LC<sub>50</sub> 550/Bluegill  
0.23 ppm/48-hour/TL<sub>m</sub>/Bluegill  
0.018 mg/l/24-hour/TL<sub>50</sub>/Scud  
0.0094 mg/l/48-hour/TL<sub>50</sub>/Scud  
0.13 ppm/96-hour/LC<sub>50</sub>/Bluegill  
2.4 ppm/96-hour/LC<sub>50</sub>/Fat head minnow  
0.13 ppm/96-hour/LC<sub>50</sub>/Guppy  
0.00001 ppm/48-hour/LC<sub>50</sub>/Daphnia magna  
6.2 **Waterfowl Toxicity:** Mallard LC<sub>50</sub> = > 5000 ppm Acute oral LD<sub>50</sub> = > 1600 mg/kg  
6.3 **Biological Oxygen Demand (BOD):** In raw river water, 90% remained after 1 week 75% remained after 2 weeks 50% remained after 8 weeks  
6.4 **Food Chain Concentration Potential:** Build-up in food chain unlikely.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 47.7% emulsifiable concentrate 2.2% emulsion 8% granular 25% wettable powder  
7.2 **Storage Temperature:** Do not store formulation 4EC below 0°F and formulation 8EC below 20°F  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 384.48  
9.3 **Boiling Point at 1 atm:** Decomposes above 150°C.  
9.4 **Freezing Point:** Pure: 19.4°F = -7°C = 266.2°K Technical: 8.6°F = -13°C = 260.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.220 at 20°C (Pure); 1.215 to 1.230 at 20°C (Technical)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 13.26  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# ETHION

ETO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# ETHYLTRICHLOROSILANE

ETS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethyl silicon trichloride Trichloroethyl silane Trichloroethyl silicone	Liquid  Colorless  Sharp irritating odor  Reacts violently with water. Irritating gas is produced on contact with water.
Evacuate. <b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Slurry discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not burn  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>2</sub>H<sub>5</sub>SiCl<sub>3</sub>  
2.3 IMO/UN Designation: 3.2/1196  
2.4 DOT ID No.: 1196  
2.5 CAS Registry No.: 115-21-9  
2.6 NAERG Guide No.: 155  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Full protective clothing; acid-vapor-type respiratory protection; rubber gloves; chemical worker's goggles; other equipment as necessary to protect skin and eyes.  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with liquid causes severe burns of eyes and skin. Ingestion causes burns of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; administer artificial respiration if breathing has stopped; call physician. EYES: flush with water for 15 min.; obtain medical attention immediately. SKIN: flush with water; obtain medical attention immediately if irritation persists. INGESTION: give large amounts of water; get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 1,330 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of the eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 57°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene gases may form.  
4.6 **Behavior in Fire:** Vapors are heavier than air and may travel a considerable distance to a source of ignition and flash back. Difficult to extinguish; re-ignition may occur. Contact with water applied to adjacent fires will produce irritating hydrogen chloride fumes.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 2.0 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 16.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** Reacts vigorously, evolving hydrogen chloride (hydrochloric acid).  
5.2 **Reactivity with Common Materials:** Reacts with surface moisture to form hydrogen chloride, which is corrosive to common metals.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 98+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	0
Special (White).....	W

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 163.5  
9.3 **Boiling Point at 1 atm:** 210°F = 99°C = 372°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.24 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 5.6  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 104 Btu/lb = 58 cal/g = 2.4 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -4,300 Btu/lb = -2,400 cal/g = -100 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ETHYLTRICHLOROSILANE

ETS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	78.549	42	0.400	42	0.873	51	4.064
40	78.370	44	0.400	44	0.873	52	4.005
45	78.200	46	0.400	46	0.873	53	3.948
50	78.030	48	0.400	48	0.873	54	3.892
55	77.849	50	0.400	50	0.873	55	3.836
60	77.679	52	0.400	52	0.873	56	3.782
65	77.509	54	0.400	54	0.873	57	3.729
70	77.330	56	0.400	56	0.873	58	3.677
75	77.160	58	0.400	58	0.873	59	3.625
80	76.990	60	0.400	60	0.873	60	3.575
85	76.809	62	0.400	62	0.873	61	3.525
90	76.639	64	0.400	64	0.873	62	3.476
95	76.469	66	0.400	66	0.873	63	3.428
100	76.290	68	0.400	68	0.873	64	3.381
		70	0.400	70	0.873	65	3.335
		72	0.400	72	0.873	66	3.290
		74	0.400	74	0.873	67	3.245
		76	0.400	76	0.873	68	3.201
				78	0.873	69	3.158
				80	0.873	70	3.116
				82	0.873	71	3.074
				84	0.873	72	3.033
				86	0.873	73	2.993
				88	0.873	74	2.954
						75	2.915
						76	2.877

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	70	0.496	70	0.01427		N
	E	80	0.670	80	0.01890		O
	A	90	0.894	90	0.02477		T
	C	100	1.181	100	0.03215		
	T	110	1.546	110	0.04133		P
	S	120	2.004	120	0.05265		E
		130	2.575	130	0.06651		R
		140	3.281	140	0.08334		T
		150	4.148	150	0.10360		I
		160	5.204	160	0.12790		N
		170	6.483	170	0.15680		E
		180	8.020	180	0.19100		N
		190	9.856	190	0.23110		T
		200	12.040	200	0.27800		
		210	14.620	210	0.33240		
		220	17.640	220	0.39540		

# EPOXIDIZED VEGETABLE OILS

EVO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Drying oil epoxides Epoxidized drying oils Epoxidized oils	Oily liquid Pale yellow Odorless  Floats on water.
Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical or carbon dioxide.
<b>Exposure</b>	Not harmful.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $(O_2CRH_2CHR_2COO)_2C_2H_5$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification:  
42000

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Currently not available  
3.2 Symptoms Following Exposure: Currently not available  
3.3 Treatment of Exposure: Currently not available  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 0; LD<sub>50</sub> above 15 g/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 585°F O.C.  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity:  
240 ppm/24 hr/brine shrimp/TL<sub>m</sub>  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 4% of theoretical in 5 days, fresh water, acclimated seed  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Epoxidized vegetable oil; Epoxidized soybean oil  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.0 at 20°C (liquid)  
9.8 Liquid Surface Tension: 36.2 dynes/cm = 0.0362 N/m at 24°C  
9.9 Liquid Water Interfacial Tension: 50 dynes/cm = 0.05 N/m at 22.7°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -13,000 Btu/lb = -7,000 cal/g = -300 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# EPOXIDIZED VEGETABLE OILS

EVO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	63.600	85	0.458	50	1.109	68	518.000
36	63.530	90	0.462	52	1.109		
38	63.460	95	0.466	54	1.109		
40	63.390	100	0.470	56	1.109		
42	63.320	105	0.474	58	1.109		
44	63.260	110	0.478	60	1.109		
46	63.190	115	0.482	62	1.109		
48	63.120	120	0.486	64	1.109		
50	63.050	125	0.489	66	1.109		
52	62.980	130	0.493	68	1.109		
54	62.910	135	0.497	70	1.109		
56	62.840	140	0.501	72	1.109		
58	62.770	145	0.505	74	1.109		
60	62.700	150	0.509	76	1.109		
62	62.630			78	1.109		
64	62.560			80	1.109		
66	62.490			82	1.109		
68	62.420			84	1.109		
70	62.350						
72	62.280						
74	62.210						
76	62.150						
78	62.080						
80	62.010						
82	61.940						
84	61.870						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T

# FERRIC AMMONIUM CITRATE

FAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium ferric citrate Ferric ammonium citrate, brown Ferric ammonium citrate, green	Solid  Red, green or brown  Odorless  Sinks and mixes slowly with water.
Keep people away. Avoid contact with solid and dust. Avoid inhalation. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Mixture of  $\text{FeC}_6\text{H}_5\text{O}_7$ ,  $(\text{NH}_4)_3\text{HC}_6\text{H}_5\text{O}_7$ , and water of hydration  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 9118  
2.5 CAS Registry No.: 1185-57-5  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Approved respirator for nuisance dust; chemical goggles or face shield  
3.2 Symptoms Following Exposure: Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes and causes mild irritation of skin on prolonged contact.  
3.3 Treatment of Exposure: INGESTION: give large amount of water. EYES or SKIN: flush with water.  
3.4 TLV-TWA: 1 mg/m<sup>3</sup> (as iron)  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen or ammonia gas may be formed in fires.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: Not pertinent (mixture)  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.8 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES



# FERRIC AMMONIUM CITRATE

FAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	25.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# FURFURYL ALCOHOL

FAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Furancarbinol Furfuralcohol 2-Furylcarbinol 2-Hydroxymethylfuran	Liquid  Colorless to light yellow  Mild irritating  Mixes with water.
Keep people away. Avoid inhalation. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $C_6H_8O_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2874  
2.5 CAS Registry No.: 98-00-0  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51231

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Inhalation causes headache, nausea, and irritation of nose and throat. Vapor irritates eyes; liquid causes inflammation and corneal opacity. Contact of skin with liquid causes dryness and irritation. Ingestion causes headache, nausea, and irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air, if breathing is difficult, call a physician. EYES: immediately flush with water for 15 min.; get medical attention. SKIN: wash promptly with soap and water. INGESTION: give large amount of water, and induce vomiting; follow with gastric lavage and saline cathartics; get medical attention.  
3.4 **TLV-TWA:** 10 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 15 ppm  
3.7 **Toxicity by Ingestion:** Grade 3; oral  $LD_{50}$  = 132 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 8 ppm  
3.13 **IDLH Value:** 75 ppm  
3.14 **OSHA PEL-TWA:** 50 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 167°F O.C. 149°F C.C.  
4.2 **Flammable Limits in Air:** 1.8%-16.3%  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 736°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 2.3 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Darkens and forms water-insoluble material on exposure to air or acids, particularly when hot.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: 2  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 98.1  
9.3 **Boiling Point at 1 atm:** 338°F = 170°C = 443°K  
9.4 **Freezing Point:** 5°F = -15°C = 258°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.13 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 38 dynes/cm = 0.038 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 230 Btu/lb = 130 cal/g =  $5.4 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -11,200 Btu/lb = -6,200 cal/g =  $-260 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.07 psia

### NOTES

# FURFURYL ALCOHOL

FAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	71.719	35	0.472	34	1.248	35	14.230
36	71.650	40	0.475	36	1.248	40	12.300
38	71.580	45	0.479	38	1.248	45	10.660
40	71.509	50	0.482	40	1.248	50	9.271
42	71.440	55	0.485	42	1.248	55	8.082
44	71.370	60	0.489	44	1.248	60	7.064
46	71.299	65	0.492	46	1.248	65	6.190
48	71.230	70	0.495	48	1.248	70	5.438
50	71.160	75	0.499	50	1.248	75	4.789
52	71.089	80	0.502	52	1.248	80	4.227
54	71.020	85	0.505	54	1.248	85	3.740
56	70.950	90	0.509	56	1.248	90	3.316
58	70.879	95	0.512	58	1.248	95	2.947
60	70.809			60	1.248	100	2.624
62	70.750			62	1.248		
64	70.679			64	1.248		
66	70.610			66	1.248		
68	70.540			68	1.248		
70	70.469			70	1.248		
72	70.400			72	1.248		
74	70.330			74	1.248		
76	70.259			76	1.248		
78	70.190			78	1.248		
80	70.120			80	1.248		
82	70.049			82	1.248		
84	69.980			84	1.248		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	80	0.014	80	0.00024		N
	I	90	0.021	90	0.00035		O
	S	100	0.030	100	0.00050		T
	C	110	0.044	110	0.00070		
	I	120	0.062	120	0.00098		P
	B	130	0.087	130	0.00135		E
	L	140	0.121	140	0.00184		R
	E	150	0.166	150	0.00248		T
		160	0.225	160	0.00332		I
		170	0.303	170	0.00440		N
		180	0.404	180	0.00577		E
		190	0.534	190	0.00751		N
		200	0.699	200	0.00969		T
		210	0.909	210	0.01241		
		220	1.172	220	0.01577		
		230	1.501	230	0.01989		
		240	1.908	240	0.02492		
		250	2.410	250	0.03103		
		260	3.023	260	0.03538		
		270	3.769	270	0.04720		
		280	4.671	280	0.05771		
		290	5.755	290	0.07016		
		300	7.053	300	0.08485		
		310	8.598	310	0.10210		
		320	10.430	320	0.12220		
		330	12.590	330	0.14570		

# FORMAMIDE

FAM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carbamide Formic acid, amide Methanamide Methanoic acid, amide	Liquid  Colorless  Faint odor of ammonia  Sinks and mixes with water. Freezing point is 36°F.
Keep people away. Avoid contact with liquid. Wear goggles, self-contained breathing apparatus, rubber gloves and overclothing. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, rubber gloves and overclothing. Extinguish with dry chemical, water, alcohol foam or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enter water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 10; Amide
- 2.2 Formula: HCONH<sub>2</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51471

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear rubber gloves, goggles, self-contained breathing apparatus and rubber overclothing.
- 3.2 **Symptoms Following Exposure:** INHALATION: A moderate irritant to mucous membranes. EYES: Moderately irritating to the eyes. SKIN: A mild to moderate irritant to the skin.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. EYES: Flush eyes with plenty of water. SKIN: Wash affected areas well with soap and water.
- 3.4 **TLV-TWA:** 10 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 6.1 - 7.5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Teratogenic
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 319°F O.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, water, alcohol foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.
- 4.5 **Special Hazards of Combustion Products:** Toxic fumes emitted on decomposition (carbon monoxide and ammonia), beginning at 180 - 210°C.
- 4.6 **Behavior in Fire:** Vapor will burn in air above 310°F.
- 4.7 **Auto Ignition Temperature:** 310°F.
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 10.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 3.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable in absence of high temperatures (decomposes to carbon monoxide and ammonia 180 - 210°C).
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 0.0% in 5 days
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent Grade (98%), Technical Grade, Practical Grade, Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 45.04
- 9.3 **Boiling Point at 1 atm:** 412°F = 210.5°C = 483.5°K
- 9.4 **Freezing Point:** 36°F = 2.55°C = 275.55°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.1334 at 20°C
- 9.8 **Liquid Surface Tension:** 58.35 dynes/cm = 0.0584 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** 14.40 dynes/cm = 0.0144 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** 5,380 Btu/lb = 2,973.8 cal/g = 125.2 x 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# FORMAMIDE

FAM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	35 40 45 50 55 60 65 70 75	6.966 6.147 5.504 4.987 4.560 4.203 3.899 3.638 3.410

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	264	0.574	264	0.00300		C U R R E N T L Y  N O T  A V A I L A B L E

# 2-FLUOROANILINE

FAN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Amino-2-fluorobenzene o-Fluoroaniline 2-Fluorobenzenamine 2-Fluorophenylamine	Liquid  Clear to pale yellow  Mild sweet odor  Sinks and mixes slowly with water.
<b>AVOID CONTACT WITH LIQUID. KEEP PEOPLE AWAY</b> Avoid inhalation. Wear rubber overclothing (including gloves) and respirator. Call fire department. Stay upwind. Use water spray to "knock down" vapors. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR HARMFUL IF INHALED. Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enter water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Do not burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: 2-FCH<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>
- 2.3 IMO/UN Designation: 6.1/2941
- 2.4 DOT ID No.: 2941
- 2.5 CAS Registry No.: 348-54-9
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51454

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; chemical goggles; protective clothing; approved respirator.
- 3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes bluish tint to fingernails, lips and ears indicative of cyanosis; headache, drowsiness, and nausea, followed by unconsciousness. Liquid can be absorbed through skin and cause similar symptoms. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: Remove victim from exposure immediately; if needed, administer oxygen; refer to physician. EYES: Flush with water for at least 15 min. SKIN: Remove victim from exposure immediately; remove contaminated clothing; wash contacted area with copious amounts of water and soap; if needed, administer oxygen; refer to physician. INGESTION: Induce vomiting; get medical attention.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 140°F C.C.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen fluoride and oxides of nitrogen may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 39.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.0%, Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester). Store containers in a well ventilated area.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 111.2
- 9.3 **Boiling Point at 1 atm:** 347°F = 175°C = 448.2°K
- 9.4 **Freezing Point:** -19.3°F = -28.5C = 244.7°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.1513 at 21°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2-FLUOROANILINE

FAN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
69	71.870		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.219 0.228 0.237 0.247 0.256 0.265 0.275 0.284 0.293 0.303 0.312 0.321 0.331 0.340 0.349 0.359 0.368 0.377 0.387 0.396 0.405 0.415 0.424 0.433 0.443

# FERRIC AMMONIUM OXALATE

FAO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium ferric oxalate trihydrate Ammonium trioxalatoferrate(III) trihydrate	Solid powder  Yellowish-green  Light burnt-sugar odor  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Avoid inhalation. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{Fe}(\text{NH}_4)_2(\text{C}_2\text{O}_4)_3 \cdot 3\text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 9119  
2.5 CAS Registry No.: 2944-67-4  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved dust respirator; rubber or plastic-coated gloves; chemical goggles or face shield
- 3.2 **Symptoms Following Exposure:** Inhalation of dust may cause irritation of nose and throat. Ingestion causes burning pain in throat and stomach; mucous membranes become white; may also cause vomiting, weak pulse, cardiovascular collapse, and death. Contact with dust irritates eyes and skin; may cause severe skin burns.
- 3.3 **Treatment of Exposure:** (treat victim promptly) INHALATION: move to fresh air; get medical attention if any symptoms persist. INGESTION: give immediately a dilute solution of any soluble calcium salt such as calcium lactate, limewater, chalk, or milk; induce vomiting; get medical attention. (Watch for edema of the glottis and delayed constriction of esophagus.) EYES: flush with water and get medical attention. SKIN: flush with water.
- 3.4 TLV-TWA: 1 mg/m<sup>3</sup> (as iron)  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen, ammonia, and carbon monoxide may form in fires.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 428  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.78 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES



# FERRIC AMMONIUM OXALATE

FAO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	100.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# FERROUS AMMONIUM SULFATE

FAS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium ferrous sulfate Ferrous ammonium sulfate hexahydrate Iron ammonium sulfate Mohr's salt	Solid  Pale blue-green  Odorless  Sinks and mixes slowly with water.
Keep people away. Avoid contact with solid and dust. Avoid inhalation. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_6 \cdot 6\text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 9122  
2.5 CAS Registry No.: 10045-89-3  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 52349

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves  
3.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes and can irritate skin on prolonged contact.  
3.3 **Treatment of Exposure:** INGESTION: give large amount of water; induce vomiting if large amounts have been swallowed. EYES or SKIN: flush with water.  
3.4 **TLV-TWA:** 1 mg/m<sup>3</sup> (as iron)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May cause eye degeneration in rabbits  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion**  
Products: Irritating and toxic ammonia and oxides of nitrogen may form in fires.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 99-102%; Reagent  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 392.16  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.86 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# FERROUS AMMONIUM SULFATE

FAS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	13.280		N		N		N
36	14.050		O		O		O
38	14.830		T		T		T
40	15.610						
42	16.390		P		P		P
44	17.170		E		E		E
46	17.940		R		R		R
48	18.720		T		T		T
50	19.500		I		I		I
52	20.280		N		N		N
54	21.050		E		E		E
56	21.830		N		N		N
58	22.610		E		E		E
60	23.390		N		N		N
62	24.170		T		T		T
64	24.940						
66	25.720						
68	26.500						
70	27.280						
72	28.050						
74	28.830						
76	29.610						
78	30.390						
80	31.170						
82	31.940						
84	32.720						

# FERRIC CHLORIDE

FCL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ferric chloride, anhydrous Ferric chloride, hexahydrate Iron III chloride Iron perchloride Iron trichloride	Solid  Greenish black  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Avoid inhalation. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{FeCl}_3$  or  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: 8/1773
- 2.4 DOT ID No.: 1773
- 2.5 CAS Registry No.: 7705-08-0
- 2.6 NAERG Guide No.: 157
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator if required; rubber apron and boots; chemical worker's goggles or face shield
- 3.2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes. Prolonged contact with skin causes irritation and burns.
- 3.3 **Treatment of Exposure:** INGESTION: give large amounts of water; induce vomiting if large amounts have been swallowed. EYES: immediately flush with plenty of water for at least 15 min.; get medical attention promptly. SKIN: flush with water.
- 3.4 TLV-TWA: 1 mg/m<sup>3</sup> (as iron)
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Water solutions are acidic and corrosive to most metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute sodium bicarbonate or soda ash solutions.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.2 ppm/144 hr/stickleback/harmful/fresh water  
1 ppm/240 hr/stickleback/safe/fresh water  
15 ppm/96 hr/daphnia/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: 0  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Anhydrous; Hydrate; Reagent; 46% solution in water
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material
- 8.2 49 CFR Class: 8
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 162.22 (anhydrous)
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.8 at 20°C (anhydrous solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: (anhydrous) -360 Btu/lb = -200 cal/g = -8.4 X 10<sup>5</sup> J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# FERRIC CHLORIDE

FCL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	75.599		N		N		N
36	76.799		O		O		O
38	78.000		T		T		T
40	79.200						
42	80.400		P		P		P
44	81.599		E		E		E
46	82.799		R		R		R
48	84.000		T		T		T
50	85.200		I		I		I
52	86.400		N		N		N
54	87.599		E		E		E
56	88.799		N		N		N
58	90.000		E		E		E
60	91.200		N		N		N
62	92.400		T		T		T
64	93.599						
66	94.799						
68	96.000						
70	97.200						
72	98.400						
74	99.599						
76	100.799						
78	102.000						
80	103.200						
82	104.400						
84	105.599						

# FERRIC GLYCEROPHOSPHATE

FCP

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Solid  Greenish-brown to greenish yellow  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Avoid inhalation. Notify local health and pollution control agencies. Protect water intakes.	
Fire	Not flammable.
Exposure	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: (approx.) Fe<sub>2</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; dust mask; rubber gloves
- 3.2 Symptoms Following Exposure: Inhalation of dust may irritate nose and throat. Contact with dust irritates eyes and (on prolonged contact) skin.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water; induce vomiting if large amounts have been swallowed. EYES: flush with water for at least 15 min. SKIN: flush with water.
- 3.4 TLV-TWA: 1 mg/m<sup>3</sup> (as iron)
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 470 (approx.)
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.5 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# FERRIC GLYCEROPHOSPHATE

FCP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	50.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# FERROUS CHLORIDE

FEC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ferrous chloride tetrahydrate Iron dichloride Iron protochloride	Solid  Pale green  Odorless  Sinks and mixes slowly with water.
Avoid inhalation. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 1759  
2.5 CAS Registry No.: 7758-94-3  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes and may cause skin irritation on prolonged contact.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: if large amounts are swallowed, promptly induce vomiting and get medical help. EYES: flush with plenty of water for at least 15 min.; get medical help promptly if ill effects develop. SKIN: wash with soap and water.  
3.4 **TLV-TWA:** 1 mg/m<sup>3</sup> (as iron)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride fumes may form in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Solutions may corrode metals.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
<38 ppm/64 hr/daphnia/toxic/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; 35% solution in water  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 198  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.93 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -18 Btu/lb = -10 cal/g = -0.42 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 61.5 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# FERROUS CHLORIDE

FEC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	50.420		N		N		N
36	51.140		O		O		O
38	51.870		T		T		T
40	52.590						
42	53.310		P		P		P
44	54.030		E		E		E
46	54.750		R		R		R
48	55.480		T		T		T
50	56.200		I		I		I
52	56.920		N		N		N
54	57.640		E		E		E
56	58.370		N		N		N
58	59.090		E		E		E
60	59.810		N		N		N
62	60.530		T		T		T
64	61.250						
66	61.980						
68	62.700						
70	63.420						
72	64.139						
74	64.870						
76	65.589						
78	66.309						
80	67.030						
82	67.750						
84	68.480						

# FURFURAL

FFA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Fural 2-Furaldehyde Fural/pyromucic aldehyde Furfuraldehyde Furfurole Pyromucic aldehyde Quakeral	Oily liquid  Colorless to reddish-brown  Almond odor  Sinks in water.
<p>Keep people away. Avoid contact with liquid.  Avoid inhalation.  Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  Call fire department.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 19; Aldehyde  
2.2 Formula:  $O-CH_2CH=CH_2CHCHO$   
2.3 IMO/UN Designation: 3.3/1199  
2.4 DOT ID No.: 1199  
2.5 CAS Registry No.: 98-01-1  
2.6 NAERG Guide No.: 132P  
2.7 Standard Industrial Trade Classification: 51622

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Skin and eye protection.  
3.2 **Symptoms Following Exposure:** Vapor may irritate eyes and respiratory system. Liquid irritates skin and may cause dermatitis.  
3.3 **Treatment of Exposure:** INHALATION: general treatment for overexposure to vapors of toxic chemicals; keep airway open, give respiration and oxygen if necessary; observe for premonitory signs and symptoms of pulmonary edema. INGESTION: induce vomiting, then give gastric lavage and saline cathartics. SKIN AND MUCOUS MEMBRANES: flood affected tissues with water.  
3.4 **TLV-TWA:** 2 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3;  $LD_{50} = 50$  to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Causes liver damage in rats.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 100 ppm  
3.14 **OSHA PEL-TWA:** 5 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 153°F O.C. 140°F C.C.  
4.2 **Flammable Limits in Air:** 2.1%-19.3%  
4.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide, dry chemical or alcohol foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 739°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 2.6 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
24 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water  
32 ppm/24 hr/sunfish/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0.28-0.77 lb/lb, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	1

8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** U125  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 96.08  
9.3 **Boiling Point at 1 atm:** 323.1°F = 161.7°C = 434.9°K  
9.4 **Freezing Point:** -33.7°F = -36.5°C = 236.7°K  
9.5 **Critical Temperature:** 746.6°F = 397°C = 670.2°K  
9.6 **Critical Pressure:** 798 psia = 54.3 atm = 5.50 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.159 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 43.5 dynes/cm = 0.0435 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 191 Btu/lb = 106 cal/g = 4.44 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -10,490 Btu/lb = -5830 cal/g = -244.1 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.1 psia

### NOTES

# FURFURAL

FFA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	73.610	20	0.367		N	35	2.388
40	73.429	30	0.370		O	40	2.248
45	73.240	40	0.372		T	45	2.119
50	73.059	50	0.374			50	1.999
55	72.879	60	0.376		P	55	1.888
60	72.690	70	0.378		E	60	1.786
65	72.509	80	0.380		R	65	1.691
70	72.320	90	0.382		T	70	1.602
75	72.139	100	0.384		I	75	1.520
80	71.959	110	0.386		N	80	1.443
85	71.770	120	0.388		E	85	1.372
90	71.589	130	0.390		N	90	1.305
95	71.410	140	0.392		T	95	1.242
100	71.219	150	0.394				
105	71.040	160	0.396				
110	70.849	170	0.398				
115	70.669	180	0.400				
120	70.490	190	0.402				
125	70.299	200	0.404				
130	70.120	210	0.407				
135	69.929	220	0.409				
140	69.750	230	0.411				
145	69.570	240	0.413				
150	69.379						
155	69.200						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	8.155	60	0.024	60	0.00042		N
36	8.210	70	0.035	70	0.00059		O
38	8.266	80	0.049	80	0.00082		T
40	8.322	90	0.069	90	0.00113		
42	8.377	100	0.096	100	0.00154		P
44	8.433	110	0.132	110	0.00207		E
46	8.488	120	0.178	120	0.00275		R
48	8.544	130	0.239	130	0.00363		T
50	8.599	140	0.318	140	0.00474		I
52	8.655	150	0.418	150	0.00614		N
54	8.710	160	0.545	160	0.00788		E
56	8.766	170	0.705	170	0.01002		N
58	8.822	180	0.905	180	0.01266		T
60	8.877	190	1.152	190	0.01587		
62	8.933	200	1.456	200	0.01975		
64	8.988	210	1.827	210	0.02441		
66	9.044	220	2.277	220	0.02999		
68	9.099	230	2.820	230	0.03660		
70	9.155	240	3.472	240	0.04442		
72	9.210	250	4.250	250	0.05360		
74	9.266	260	5.172	260	0.06433		
76	9.322	270	6.261	270	0.07680		
78	9.377	280	7.540	280	0.09124		
80	9.433	290	9.035	290	0.10790		
82	9.488	300	10.780	300	0.12700		
84	9.544						

# FERROUS FLUOROBORATE

FFB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ferrous borofluoride	Liquid Yellow-green  Sinks and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear goggles and self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Irritating gases may be produced when heated.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Fe}(\text{BF}_4)_2 \cdot \text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation.
- 3.3 Treatment of Exposure: INGESTION: give large amount of water; induce vomiting; get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water.
- 3.4 TLV-TWA: 1 mg/m<sup>3</sup> (as iron)
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 50% solution in water
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 229.5 (solute only)
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: (est.) >1.1 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# FERROUS FLUOROBORATE

FFB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	68.660		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# FERRIC FLUORIDE

FFX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Iron fluoride		Solid crystals      Green  Sinks and mixes slowly with water.
Keep people away. Avoid contact with solid or dust. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).	
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST OR SOLID Irritating to eyes, nose, and throat. If swallowed, will cause lethargy, nausea, and vomiting. Move to fresh air. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.	
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{FeF}_3$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 9120
- 2.5 CAS Registry No.: 7783-50-8
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles, polyvinyl chloride or neoprene gloves, filter type respirator, chemical apron.
- 3.2 **Symptoms Following Exposure:** INHALATION: Inorganic fluorides are generally irritating.  
INGESTION: Ingestion of iron compounds can cause: lethargy, retching, vomiting, tarry stools, fast and weak pulse, low blood pressure, and coma.
- 3.3 **Treatment of Exposure:** EYES: Flush with plenty of water for at least 15 minutes. Get medical attention. SKIN: Flush with soap and water. INGESTION: Give water, milk, or activated charcoal and induce vomiting. Sodium sulfate catharsis.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** May give off fumes or vapors of fluorides; hydrofluoric acid.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
419 mg(F)/l/96-hour/TL<sub>m</sub>/Mosquito fish  
120 mg(F)/l/4 days/lethal concentration/goldfish
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 100 pounds
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 112.85
- 9.3 Boiling Point at 1 atm: Sublimes >1000°C
- 9.4 Freezing Point: >1832°F = >1000° = 1273.2°K
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 3.87 at room temperature
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Currently not available
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: 159.5 Btu/lb = 88.6 cal/g =  $3.7 \times 10^5$  J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# FERRIC FLUORIDE

FFX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.091		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# 4-FLUOROANILINE

FLA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Amino-4-fluorobenzene p-Fluoroaniline 4-Fluorobenzeneamine 4-Fluorophenylamine	Liquid  Clear to pale yellow  Mild sweet odor  Sinks and mixes slowly with water.
<b>AVOID CONTACT WITH LIQUID. KEEP PEOPLE AWAY</b> Avoid inhalation. Wear rubber overclothing (including gloves) and respirator Call fire department Stay upwind. Use water spray to "knock down" vapors. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR MAY BE HARMFUL IF INHALED Remove to fresh air. If breathing is stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Do not burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 4-FC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/2944  
2.4 DOT ID No.: 2941  
2.5 CAS Registry No.: 371-40-4  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51454

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; chemical goggles; protective clothing; dust respirator.  
3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes bluish tint to fingernails, lips and ears indicative of cyanosis; headache, drowsiness, and nausea, followed by unconsciousness. Liquid can be absorbed through skin and cause similar symptoms. Contact with eyes causes irritation.  
3.3 **Treatment of Exposure:** INHALATION: Remove victim from exposure immediately; if needed, administer oxygen; refer to physician. EYES: Flush with water for at least 15 min. SKIN: Remove victim from exposure immediately; remove contaminated clothing; wash contacted area with copious amounts of water and soap; if needed, administer oxygen; refer to physician. INGESTION: Induce vomiting; get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 417 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 165°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen fluoride and oxides of nitrogen may form in fires.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 39.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Dat not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.0%, Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester). Store containers in a well ventilated area.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 111.2  
9.3 **Boiling Point at 1 atm:** 358.7°F = 181.5°C = 454.7°K  
9.4 **Freezing Point:** 30.6°F = -0.8°C = 272.4°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.1725 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# 4-FLUOROANILINE

FLA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	73.200		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.219 0.228 0.237 0.247 0.256 0.265 0.275 0.284 0.293 0.303 0.312 0.321 0.331 0.340 0.349 0.359 0.368 0.377 0.387 0.396 0.405 0.415 0.424 0.433 0.443

# FLUOROBENZENE

FLB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzene fluoride MFB Monofluorobenzene Phenyl fluoride	Watery liquid      Colorless      Benzene odor  May float or sink in water. Flammable vapor is produced.
<b>Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Shut off ignition sources. Call fire department. Stay upwind and use water spray to "knock down" vapor. Protect water intakes. Extinguish with dry chemical, foam, or carbon dioxide.</b>	
<b>Fire</b>	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide.
<b>Exposure</b>	Call for medical aid.  VAPOR If inhaled will cause coughing or dizziness. Not irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim; Pump (as appropriate) Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>6</sub> H <sub>5</sub> F 2.3 IMO/UN Designation: 3.2/2387 2.4 DOT ID No.: 2387 2.5 CAS Registry No.: 462-06-6 2.6 NAERG Guide No.: 130 2.7 Standard Industrial Trade Classification: 51129
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Organic vapor-acid gas respirator where appropriate; neoprene or vinyl gloves; chemical safety spectacles, plus face shield where appropriate; rubber footwear; apron or impervious clothing for splash protection; hard hat. 3.2 <b>Symptoms Following Exposure:</b> Irritating to skin, eyes and mucous membranes. Repeated exposure of skin may cause dermatitis due to defatting action. Chronic inhalation of vapors or mist may result to damage to lungs, liver and kidneys. Acute vapor exposures can cause symptoms ranging from coughing to transient anesthesia and central nervous system depression. 3.3 <b>Treatment of Exposure:</b> Get medical attention for all eye exposures and any serious over-exposures. Treat the symptoms. INHALATION: Remove to clean air; administer oxygen as needed. INGESTION: Dilute by drinking water, if vomiting occurs, administer more water. Administer saline laxative. EYES: Flush thoroughly with water. SKIN: Remove contaminated clothing, wash exposed area with soap and water. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 2; LD <sub>50</sub> = 4.4 g/kg (rat) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 9°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical, foam or water spray  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Burning in open flame can form toxic hydrogen fluoride gases.  
4.6 Behavior in Fire: Heavy vapor can travel a considerable distance to a source of ignition and flash back.  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 33.3 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 9.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  
Category      Classification  
Health Hazard (Blue)..... 2  
Flammability (Red)..... 3  
Instability (Yellow)..... 0  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 96.10  
9.3 Boiling Point at 1 atm: 185.2°F = 85.1°C = 358.3°K  
9.4 Freezing Point: -42.2°F = -41.2°C = 232°K  
9.5 Critical Temperature: 546.8°F = 286°C = 559.2°K  
9.6 Critical Pressure: 656 psia = 44.6 atm = 4.52 MN/m<sup>2</sup>  
9.7 Specific Gravity: 1.0225 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 3.31  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: (est.) -13,995 Btu/lb = -7,775 cal/g = -325 x 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 2.8 psia

## NOTES

# FLUOROBENZENE

FLB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	63.830	77	0.370		C U R R E N T L Y  N O T  A V A I L A B L E	70 80 90 100 110 120 130 140 150 160 170 180 190 200 210	0.587 0.549 0.516 0.486 0.459 0.434 0.412 0.391 0.371 0.353 0.336 0.320 0.304 0.290 0.276

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	-40 -20 0 20 40 60 80 100 120 140 160	0.039 0.069 0.120 0.210 0.369 0.646 1.132 1.983 3.475 6.089 10.670		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.193 0.203 0.212 0.222 0.231 0.241 0.250 0.259 0.269 0.278 0.288 0.297 0.307 0.316 0.326 0.335 0.344 0.354 0.363 0.373 0.382 0.392 0.401 0.410 0.420

# 2-FLUOROTOLUENE

FLT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Fluoro-2-methylbenzene 2-Fluoro-1-methylbenzene o-Fluorotoluene 1-Methyl-2-fluorobenzene o-Tolyl fluoride	Liquid  Colorless  Aromatic  May sink or float on water.
<b>Keep people away. Avoid contact with vapor or liquid. Avoid inhalation. Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Flammable. Poisonous gases may be produced in fire. Containers may explode in fire. Flash back along vapor trail may occur. Vapor may explode if ignited in enclosed area. Wear self-contained breathing apparatus and full protective clothing. Small fires: extinguish with dry chemicals, CO <sub>2</sub> , water spray, or foam. Large fires: extinguish with water spray, fog, or foam. Cool exposed containers with water from the side until well after fire is out.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR May be harmful if inhaled or absorbed through the skin. Irritating to eyes, skin, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed or absorbed through the skin. IF IN EYES OR ON SKIN: flush with running water for at least 15 minutes; hold eyelids open if necessary. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk. DO NOT INDUCE VOMITING IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm. Remove and isolate contaminated clothing and shoes at the site.
<b>Water Pollution</b>	Effects of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim; Pump (as appropriate) Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: 2-FC <sub>6</sub> H <sub>4</sub> CH <sub>3</sub> 2.3 IMO/UN Designation: 3.3/2388 2.4 DOT ID No.: 2388 2.5 CAS Registry No.: 95-52-3 2.6 NAERG Guide No.: 130 2.7 Standard Industrial Trade Classification: 51129
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Inhalation of vapor may cause respiratory irritation. Prolonged and repeated vapor exposures may produce systemic toxic effects. 3.3 <b>Treatment of Exposure:</b> INHALATION: Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. INGESTION: DO NOT INDUCE VOMITING. If victim is unconscious or having convulsions, do nothing except keep victim warm. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; LD <sub>50</sub> = 100 mg/kg (BWD) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Prolonged and repeated vapor exposure may produce systemic effects. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations. 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 55°F C.C.  
4.2 **Flammable Limits in Air:** 1.3% (LFL)  
4.3 **Fire Extinguishing Agents:** Dry chemical, CO<sub>2</sub>, or foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** May contain toxic fluoride fumes.  
4.6 **Behavior in Fire:** Container may explode in heat of fire. Vapor may travel to a source of ignition and flashback. Vapor explosion hazard indoors, outdoors or in sewer. Toxic fluoride fumes may be produced.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Reacts with oxidizing agents.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Not listed  
7.4 **Venting:** Not pertinent  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable Liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 110.13  
9.3 **Boiling Point at 1 atm:** 237.2°F = 114°C = 387.2°K  
9.4 **Freezing Point:** -79.6°F = -62°C = 211.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.0041 at 13°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.8  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.91 psia

## NOTES

# 2-FLUOROTOLUENE

FLT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
55	62.680		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	0 20 40 60 80 100 120 140 160 180 200	0.045 0.076 0.127 0.214 0.360 0.605 1.018 1.714 2.884 4.852 8.166		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.214 0.224 0.234 0.245 0.255 0.265 0.275 0.285 0.295 0.306 0.316 0.326 0.336 0.346 0.356 0.366 0.377 0.387 0.397 0.407 0.417 0.427 0.437 0.448 0.458

# FORMIC ACID

FMA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Formylic acid Methanoic acid	Liquid  Colorless  Penetrating odor  Sinks and mixes with water. Freezing point is 47°F.
Keep people away. AVOID CONTACT WITH LIQUID. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 4; Organic acid  
2.2 Formula: HCOOH  
2.3 IMO/UN Designation: 8.0/1779  
2.4 DOT ID No.: 1779  
2.5 CAS Registry No.: 64-18-6  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51374

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; chemical goggles or face shield; rubber suit, gloves, and shoes.
- 3.2 **Symptoms Following Exposure:** Liquid causes skin and eye burns. Vapors are irritating and painful to breath. Vapor exposure may cause nausea and vomiting.
- 3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air; give oxygen if breathing is difficult; call a physician. INGESTION: do NOT induce vomiting; give water or milk. SKIN OR EYES: immediately flush affected area with plenty of water for at least 15 min.; get medical care for eyes.
- 3.4 **TLV-TWA:** 5 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 10 ppm
- 3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 1.21 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 30 ppm
- 3.14 **OSHA PEL-TWA:** 5 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 138°F O.C.
- 4.2 **Flammable Limits in Air:** 18%-57%
- 4.3 **Fire Extinguishing Agents:** Water, carbon dioxide, dry chemical, or alcohol foam
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic vapor generated in fires
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 1114°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 0.5 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 2.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 2.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable; May generate carbon monoxide during storage.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, then neutralize with lime.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
175 mg/1/24 hr/bluegill/TL<sub>50</sub>/fresh water  
120 ppm/48 hr/daphnia/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 2%, 5 days; 40% (theor.), 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, pharmaceutical: 85-95%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** U123
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 46.03
- 9.3 **Boiling Point at 1 atm:** 214°F = 101°C = 374°K
- 9.4 **Freezing Point:** 47.1°F = 8.4°C = 281.6°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.22 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 38 dynes/cm = 0.038 N/m at 15°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.228
- 9.12 **Latent Heat of Vaporization:** 216 Btu/lb = 120 cal/g = 5.02 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -2045 Btu/lb = -1136 cal/g = -47.56 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) -26 Btu/lb = -14 cal/g = -0.6 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 66.05 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 1.5 psia

### NOTES

# FORMIC ACID

FMA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	76.650	70	0.511	55	1.905	N O T	P E R T I N E N T
55	76.450	80	0.515	60	1.904		
60	76.240	90	0.518	65	1.902		
65	76.030	100	0.522	70	1.901		
70	75.820	110	0.526	75	1.899		
75	75.610	120	0.530	80	1.898		
80	75.410	130	0.534	85	1.896		
85	75.200	140	0.538	90	1.894		
90	74.990	150	0.542	95	1.893		
95	74.780	160	0.546	100	1.891		
100	74.570	170	0.550	105	1.890		
		180	0.553	110	1.888		
		190	0.557	115	1.886		
		200	0.561	120	1.885		
		210	0.565	125	1.883		
				130	1.882		
				135	1.880		
				140	1.879		
				145	1.877		
				150	1.875		
				155	1.874		
				160	1.872		
				165	1.871		
				170	1.869		
				175	1.868		
				180	1.866		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		40	0.268	40	0.00230	0	0.214
		50	0.365	50	0.00307	25	0.221
		60	0.491	60	0.00405	50	0.228
		70	0.652	70	0.00528	75	0.234
		80	0.858	80	0.00681	100	0.240
		90	1.117	90	0.00871	125	0.247
		100	1.441	100	0.01104	150	0.253
		110	1.842	110	0.01386	175	0.259
		120	2.335	120	0.01727	200	0.265
		130	2.936	130	0.02135	225	0.271
		140	3.663	140	0.02620	250	0.277
		150	4.539	150	0.03192	275	0.282
		160	5.584	160	0.03864	300	0.288
		170	6.825	170	0.04648	325	0.294
		180	8.290	180	0.05557	350	0.299
		190	10.010	190	0.06607	375	0.304
		200	12.020	200	0.07811	400	0.309
		210	14.350	210	0.09187	425	0.314
						450	0.319
						475	0.324
						500	0.329
						525	0.334
						550	0.338
						575	0.343
						600	0.347

# FORMALDEHYDE SOLUTION

FMS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Formalin Formalith Formic aldehyde solution Fyde Methanal solution	Watery liquid  Colorless  Irritating odor  Sinks and mixes with water.
Keep people away. Avoid contact with liquid. Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 19; Aldehyde  
2.2 Formula:  $\text{HCHO}/\text{H}_2\text{O}/\text{CH}_3\text{OH}$   
2.3 IMO/UN Designation: 3.3/1198 (Flammable Solutions) 3.3/2209 (Solutions)  
2.4 DOT ID No.: 1198 (Flammable Solutions) 2209 (Solutions)  
2.5 CAS Registry No.: 50-00-0  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; chemical goggles; protective clothing; synthetic rubber or plastic gloves.
- 3.2 **Symptoms Following Exposure:** INHALATION: vapors are irritating and will cause coughing, chest pain, nausea, and vomiting. INGESTION: causes nausea, vomiting, abdominal pain, and collapse. Contact with skin and eyes causes severe irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give oxygen if breathing is difficult; call a physician. INGESTION: induce vomiting at once and repeat until vomit is clear; then give milk or raw egg and call a physician. SKIN OR EYES: flush immediately with plenty of water for at least 15 min; remove contaminated clothing; call a physician for eyes.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 0.3 ppm  
3.7 Toxicity by Ingestion: (Formaldehyde solution) Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 Liquid or Solid Characteristics: Causes smarting of the skin and first-degree burns on short exposure. May cause secondary burns on long exposure.  
3.12 Odor Threshold: 0.8 ppm  
3.13 IDLH Value: 20 ppm  
3.14 OSHA PEL-TWA: 0.75 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: 2 ppm  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** (37% formaldehyde) Methanol-free: 182°F C.C. 15% methanol: 122°F C.C.  
4.2 **Flammable Limits in Air:** 7.0%-73%  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide, or alcohol foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Toxic vapors are generated.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 806°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** (formaldehyde) 25 mg/1/96 hr/channel cat/TL<sub>50</sub>/fresh water  
32 ppm/24 hr/catfish/TL<sub>50</sub>/fresh water  
100-330 ppm/48 hr/founder/TL<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 37%, 5 days; 47% (theor.), 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 37-50% formaldehyde in water containing 0-15% methyl alcohol  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: U122  
8.9 EPA FWPCL List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 18-30  
9.3 Boiling Point at 1 atm: Varies with concentration  
9.4 Freezing Point: Varies with concentration  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.1 at 25°C (liquid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.09 psia

### NOTES



# FORMALDEHYDE SOLUTION

FMS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	69.240	35	0.782		N		N
40	69.150	40	0.784		O		O
45	69.059	45	0.787		T		T
50	68.980	50	0.790				
55	68.889	55	0.793		P		P
60	68.799	60	0.795		E		E
65	68.719	65	0.798		R		R
70	68.629	70	0.801		T		T
75	68.540	75	0.804		I		I
80	68.459	80	0.807		N		N
85	68.370	85	0.809		E		E
90	68.280	90	0.812		N		N
95	68.200	95	0.815		T		T
100	68.110	100	0.818				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	70	0.028		C		N
	I	75	0.034		U		O
	S	80	0.042		R		T
	C	85	0.051		R		
	I	90	0.061		E		P
	B	95	0.074		N		E
	L	100	0.089		T		R
	E	105	0.107		L		T
		110	0.128		Y		I
		115	0.152				N
		120	0.181		N		O
		125	0.214		O		
		130	0.253		T		
		135	0.298				
		140	0.350		A		
		145	0.410		V		
		150	0.479		A		
		155	0.558		I		
		160	0.648		L		
		165	0.752		A		
		170	0.870		B		
		175	1.004		L		
		180	1.157		E		
		185	1.329				
		190	1.524				
		195	1.744				

# FERRIC NITRATE

FNT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ferric nitrate nonahydrate Nitric acid, iron(III) salt	Solid  Green, colorless to pale violet  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Avoid inhalation. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: 5.1/1466
- 2.4 DOT ID No.: 1466
- 2.5 CAS Registry No.: 10421-48-4
- 2.6 NAERG Guide No.: 140
- 2.7 Standard Industrial Trade Classification: 52359

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves
- 3.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes and can irritate skin on prolonged contact.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water; induce vomiting if large amounts have been swallowed. EYES: flush with water; get medical attention if irritation persists. SKIN: flush with water.
- 3.4 **TLV-TWA:** 1 mg/m<sup>3</sup> (as iron)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 - 5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and nitric acid vapor may form in fires.
- 4.6 **Behavior in Fire:** In contact with combustible materials, will increase the intensity of a fire. Apply water to cool containers or spilled material.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Solutions are corrosive to most metals.  
Contact of solid with wood or paper may cause fire.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 99.0%; Analytical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 404.02
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 117°F = 47°C = 320°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.7 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 40 Btu/lb = 22 cal/g = 0.92 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# FERRIC NITRATE

FNT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	67.950		N		N		N
36	68.809		O		O		O
38	69.660		T		T		T
40	70.520						
42	71.379		P		P		P
44	72.230		E		E		E
46	73.089		R		R		R
48	73.940		T		T		T
50	74.799		I		I		I
52	75.650		N		N		N
54	76.509		E		E		E
56	77.360		N		N		N
58	78.219		E		E		E
60	79.080		N		N		N
62	79.929		T		T		T
64	80.790						
66	81.639						
68	82.500						
70	83.349						
72	84.209						
74	85.059						
76	85.919						
78	86.780						
80	87.629						
82	88.490						
84	89.339						

# FERROUS OXALATE

FOX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ferrous oxalate dihydrate Ferrox Iron protoxalate Oxalic acid, ferrous salt	Solid  Yellow  Odorless   Sinks in water.
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Avoid contact with solid and dust.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{FeC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves
- 3.2 **Symptoms Following Exposure:** Inhalation of dust may cause irritation of nose and throat. Ingestion causes burning pain in throat and stomach; mucous membranes turn white; can also cause vomiting, weak pulse, collapse, and death. Dust irritates eyes and may irritate skin on prolonged contact.
- 3.3 **Treatment of Exposure:** (must be prompt) INHALATION: move to fresh air; get medical attention if any symptoms persist. INGESTION: give immediately by mouth a dilute solution of any soluble calcium salt (calcium lactate, lime water, chalk solution, or even milk); large amounts of calcium are required; give gastric lavage with dilute lime water; consult physician. Watch for edema of the glottis and delayed constriction of esophagus. EYES: flush with water for at least 15 min. SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Iron fume or iron oxide fume may form in fire.
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 179.9
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.3 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# FERROUS OXALATE

FOX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# FERROPHOSPHORUS

FPS

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid

Keep people away.  
Avoid inhalation.  
Wear protective clothing and approved respirator.  
Notify local health and pollution control agencies.

### Fire

Wear full protective clothing with self-contained breathing apparatus.  
Extinguish fire with dry chemical, alcohol foam, carbon dioxide.  
Use water spray to cool exposed containers.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
Move victim to fresh air.  
Remove contaminated clothing and shoes.  
Flush affected areas with water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Clean shore line

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: Alloy of iron and phosphorus
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: Not listed.
- 2.5 CAS Registry No.: 8049-19-2
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 67150

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear protective clothing to prevent contact with dust. Use approved respirator to protect against dust.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.
- 4.5 **Special Hazards of Combustion**  
Products: Irritating vapors and toxic gases, such as phosphorus oxides or phosphoric acid, may be formed when involved in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard:  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades, 18% or 25% phosphorus.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Not listed.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** Currently not available
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** Currently not available
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# FERROPHOSPHORUS

FPS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT PERTINENT		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	CURRENTLY NOT AVAILABLE		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

# FERROUS SULFATE

FRS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Copperas Green vitriol Iron (ous) sulfate Iron vitriol	Solid                      Green                      Odorless  Sinks and mixes with water.
Avoid inhalation. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID If swallowed will cause nausea, vomiting or loss of consciousness. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 9125  
2.5 CAS Registry No.: 7720-78-7  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 52349

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Mask if dust is present.  
3.2 **Symptoms Following Exposure:** INGESTION: abdominal pain, retching, diarrhea, dehydration, shock, pallor, cyanosis, rapid or weak pulse, shallow respiration, low blood pressure.  
3.3 **Treatment of Exposure:** INGESTION: give milk immediately and then induce vomiting by stroking the pharynx with a blunt object such as a spoon handle. Gastric lavage with 1 pint of 5% aqueous solution of mono- or disodium phosphate if promptly available; otherwise use water. Get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** None  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
100 ppm/4.2 hr/bass/lethal/fresh water  
56 ppm/48 hr/shrimp/LC<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** USP; Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 169.96  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.90 at 15°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# FERROUS SULFATE

FRS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	16.300		N		N		N
36	16.920		O		O		O
38	17.530		T		T		T
40	18.140						
42	18.750		P		P		P
44	19.360		E		E		E
46	19.970		R		R		R
48	20.580		T		T		T
50	21.190		I		I		I
52	21.800		N		N		N
54	22.420		E		E		E
56	23.030		N		N		N
58	23.640		E		E		E
60	24.250		N		N		N
62	24.860		T		T		T
64	25.470						
66	26.080						
68	26.690						
70	27.300						
72	27.920						
74	28.530						
76	29.140						
78	29.750						
80	30.360						
82	30.970						
84	31.580						

# FLUOSULFONIC ACID

FSA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Fluorosulfonic acid Fluorosulfuric acid	Liquid                      Colorless to light yellow                      Choking odor  Reacts violently with water. Irritating mist and gas are produced on contact with water.
Evacuate. <b>KEEP PEOPLE AWAY.</b> Avoid inhalation. <b>AVOID CONTACT WITH LIQUID, GAS AND MIST.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. DO NOT USE WATER OR FOAM ON ADJACENT FIRES.
<b>Exposure</b>	Call for medical aid.  VAPOR OR MIST Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Chemical and Physical Treatment:  
 Neutralize  
 Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula: FSO<sub>3</sub>H  
 2.3 IMO/UN Designation: 8/1777  
 2.4 DOT ID No.: 1777  
 2.5 CAS Registry No.: 7789-21-1  
 2.6 NAERG Guide No.: 137  
 2.7 Standard Industrial Trade Classification: 52236

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, shoes, and clothing; goggles and face shield; acid-type canister mask or air-line mask.
- 3.2 **Symptoms Following Exposure:** Inhalation of fumes causes severe irritation of nose and throat. Contact of liquid with eyes or skin causes very severe burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention quickly following all exposures to this compound.  
 INHALATION: remove victim to fresh air; if he is unconscious, give artificial respiration. EYES: flush with water until medical help arrives. SKIN: flush with water until medical help arrives; soak burned area in strong Epsom salt solution; pay particular attention to area around fingernails. INGESTION: give large amounts of water.
- 3.4 TLV-TWA: Not listed.  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 Toxicity by Ingestion: Currently not available.  
 3.8 Toxicity by Inhalation: Currently not available.  
 3.9 Chronic Toxicity: Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.  
 3.14 OSHA PEL-TWA: Not listed.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
 Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water or foam on adjacent fires.
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating fumes of hydrogen fluoride and sulfuric acid may form in fires.
- 4.6 **Behavior in Fire:** Contact with water applied to adjacent fires produces toxic, irritating fumes of hydrogen fluoride.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently with water to generate hydrogen fluoride and sulfuric acid mists.
- 5.2 **Reactivity with Common Materials:**  
 Reacts with metals, generating flammable hydrogen.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
 Currently not available
- 6.4 **Food Chain Concentration Potential:**  
 None
- 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 2  
 Human Oral hazard: 3  
 Human Contact hazard: II  
 Reduction of amenities: XXXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98.5%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum, with protection from moisture in air.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 100.07
- 9.3 **Boiling Point at 1 atm:** 324.9°F = 162.7°C = 435.9°K
- 9.4 **Freezing Point:** -125.1°F = -87.3°C = 185.9°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.73 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
 Not pertinent
- 9.12 **Latent Heat of Vaporization:** 170 Btu/lb = 94 cal/g = 3.9 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# FLUOSULFONIC ACID

FSA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	110.900	52	0.500	52	1.129	0	2.980
40	110.599	54	0.500	54	1.129	5	2.845
45	110.200	56	0.500	56	1.129	10	2.718
50	109.900	58	0.500	58	1.129	15	2.599
55	109.500	60	0.500	60	1.129	20	2.488
60	109.200	62	0.500	62	1.129	25	2.384
65	108.799	64	0.500	64	1.129	30	2.286
70	108.500	66	0.500	66	1.129	35	2.194
75	108.099	68	0.500	68	1.129	40	2.108
80	107.799	70	0.500	70	1.129	45	2.026
85	107.400	72	0.500	72	1.129	50	1.949
90	107.099	74	0.500	74	1.129	55	1.877
95	106.700	76	0.500	76	1.129	60	1.808
100	106.400	78	0.500	78	1.129	65	1.744
105	106.000	80	0.500	80	1.129	70	1.682
110	105.700	82	0.500	82	1.129	75	1.624
115	105.400	84	0.500	84	1.129	80	1.569
120	105.000	86	0.500	86	1.129	85	1.517
125	104.700					90	1.467
130	104.299					95	1.420
135	104.000					100	1.376
140	103.599					105	1.333
						110	1.292
						115	1.254
						120	1.217
						125	1.182

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	-20	0.001	-20	0.00002		N
	E	-10	0.002	-10	0.00004		O
	A	0	0.003	0	0.00006		T
	C	10	0.004	10	0.00009		
	T	20	0.007	20	0.00013		P
	S	30	0.010	30	0.00019		E
		40	0.015	40	0.00027		R
		50	0.021	50	0.00039		T
		60	0.030	60	0.00054		I
		70	0.043	70	0.00076		N
		80	0.060	80	0.00104		E
		90	0.083	90	0.00140		N
		100	0.113	100	0.00188		T
		110	0.152	110	0.00249		
		120	0.203	120	0.00327		
		130	0.269	130	0.00425		
		140	0.352	140	0.00547		
		150	0.457	150	0.00698		
		160	0.588	160	0.00884		
		170	0.751	170	0.01112		
		180	0.951	180	0.01387		
		190	1.197	190	0.01718		
		200	1.496	200	0.02113		
		210	1.856	210	0.02584		

# FERRIC SULFATE

FSF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Iron sesquisulfate Iron (III) sulfate Iron tersulfate	Solid  Gray to white  Odorless  Sinks and mixes slowly with water.
<b>Keep people away. Avoid contact with solid and dust.</b> <b>Avoid inhalation.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** Fe<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** 9121  
2.5 **CAS Registry No.:** 10028-22-5  
2.6 **NAERG Guide No.:** 171  
2.7 **Standard Industrial Trade Classification:** 52349

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves  
3.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes and can irritate skin on prolonged contact.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water; induce vomiting if large amounts have been swallowed. EYES: flush with water; get medical attention if irritation persists. SKIN: flush with water.  
3.4 **TLV-TWA:** 1 mg/m<sup>3</sup> (as iron)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Corrosive to copper, copper alloys, mild steel, and galvanized steel.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 0.716 ppm/12-24 hr/shiners, carp, suckers/killed/fresh water  
133 ppm/48 hr/mosquito fish/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Anhydrous; Hydrate, 73%; sometimes shipped as water solutions, which are acidic.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 399.88  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 3.1 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -53.3 Btu/lb = -29.6 cal/g = -1.24 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# FERRIC SULFATE

FSF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# FLUOSILICIC ACID

FSL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Fluosilicic acid Hexafluosilicic acid Hydrofluosilicic acid Hydrogen hexafluorosilicate Sand acid Silicofluoric acid	Liquid  Colorless  Sharp unpleasant odor  Sinks and mixes with water.
<b>Keep people away. Avoid contact with liquid and vapor. Avoid inhalation. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Not Flammable. Irritating gases may be produced when heated.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{H}_2\text{SiF}_6\cdot\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: 8/1778
- 2.4 DOT ID No.: 1778
- 2.5 CAS Registry No.: 1309-45-1
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52236

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; safety glasses; protective clothing
- 3.2 **Symptoms Following Exposure:** Inhalation of vapor produces severe corrosive effect on mucous membrane. Ingestion causes severe burns of mouth and stomach. Contact with liquid or vapor causes severe burns of eyes and skin.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; get medical attention. INGESTION: give large amounts of water; do NOT induce vomiting. EYES: immediately wash with water for 15 min.; call a physician. SKIN: wash affected parts with water; treat as for hydrogen fluoride burn with iced benzalkonium chloride soaks.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Irritating fumes of hydrogen fluoride may form in fire.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Will corrode most metals, producing flammable hydrogen gas, which may collect in enclosed spaces.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium carbonate or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 22-30% solutions in water
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 144.09 (solute only)
- 9.3 **Boiling Point at 1 atm:** (water) -212°F = -100°C = -373°K
- 9.4 **Freezing Point:** (typical) -24 to -4°F = -31 to -20°C = 242 to 253°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** (approx.) 1.3 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# FLUOSILICIC ACID

FSL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	81.150		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# FERROSILICON

FSN

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid

May react with water.

Avoid contact with solid.  
Avoid inhalation.  
Wear protective clothing and approved respirator.  
Shut off ignition sources. Call fire department.  
Notify local health and pollution control agencies.

### Fire

Flammable solid.  
Dangerous when wet.  
Wear full protective clothing with self-contained breathing apparatus.  
Extinguish fire with dry chemical, alcohol foam, carbon dioxide.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
Move victim to fresh air.  
Remove contaminated clothing and shoes.  
Flush affected areas with water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Do not add water to undissolved material

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Alloy of iron and silicon.  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: 1408  
2.5 CAS Registry No.: 8049-17-0  
2.6 NAERG Guide No.: 139  
2.7 Standard Industrial Trade Classification: 67150

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear protective clothing to prevent contact with dust. Use approved respirator to protect against dust.  
3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat. Toxic if inhaled or ingested.  
3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water. Dangerous when wet.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases may be formed when involved in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dangerous when wet. Reacts with water to release hydrogen gas.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades, silicon content ranges from 30 - 90%.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Dangerous When Wet  
8.2 **49 CFR Class:** 4.3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** Currently not available  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 5.4  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES



# FERROSILICON

FSN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT PERTINENT		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	CURRENTLY NOT AVAILABLE		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

# 3-FLUOROTOLUENE

FTO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Fluoro-3-methylbenzene m-Fluorotoluene 1-Methyl-3-fluorobenzene m-Tolyl fluoride	Liquid  Colorless  Aromatic  May float or sink in water.
<b>Keep people away. Avoid contact with vapor or liquid. Avoid inhalation. Wear self-contained breathing apparatus and full protective clothing. Shut off all ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Flammable. Poisonous gases may be produced in fire. Containers may explode in fire. Flash back along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus and full protective clothing. Small fires: extinguish with dry chemical, CO <sub>2</sub> , water spray, or foam. Large fires: extinguish with water spray, fog, or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR May be harmful if inhaled or absorbed through the skin. Irritating to eyes, skin, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed or absorbed through skin. Irritating to skin and eyes. IF IN EYES OR ON SKIN: flush with running water for at least 15 minutes, hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk. DO NOT INDUCE VOMITING. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump (as appropriate)  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 3-FC<sub>6</sub>H<sub>4</sub>CH<sub>3</sub>  
2.3 IMO/UN Designation: 3.2/2388  
2.4 DOT ID No.: 2388  
2.5 CAS Registry No.: 352-70-5  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes upper respiratory irritation. Irritating to skin and eyes. May be absorbed through the skin. Prolonged exposure may result in systemic toxic effects. Harmful if swallowed.
- 3.3 **Treatment of Exposure:** INHALATION: Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If victim is conscious, have victim drink water or milk. DO NOT INDUCE VOMITING. If victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Prolonged and repeated vapor exposure may result systemic toxic effects.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 49°F, C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** May contain toxic fluoride fumes.
- 4.6 **Behavior in Fire:** May produce toxic and irritating fluoride fumes.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: \*  
Human Oral hazard: \*  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Not listed
- 7.4 **Venting:** Not pertinent
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 110.13
- 9.3 **Boiling Point at 1 atm:** 240.8°F = 116°C = 389.2°K
- 9.4 **Freezing Point:** -125.9°F = -87.7°C = 185.5°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.9986 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 3.8
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.82 psia

### NOTES

# 3-FLUOROTOLUENE

FTO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	62.340		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	0 20 40 60 80 100 120 140 160 180 200 220	0.041 0.069 0.115 0.194 0.326 0.548 0.920 1.547 2.600 4.369 7.343 12.342		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.214 0.224 0.234 0.245 0.255 0.265 0.275 0.285 0.295 0.306 0.316 0.326 0.336 0.346 0.356 0.366 0.377 0.387 0.397 0.407 0.417 0.427 0.437 0.448 0.458

# 4-FLUOROTOLUENE

FTU

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Fluoro-4-methylbenzene 4-Fluoro-1-methylbenzene p-Fluorotoluene p-Tolyl fluoride	Liquid  Colorless  Aromatic  May sink or float on water.
<b>Keep people away. Avoid contact with vapor or liquid. Avoid inhalation. Wear self-contained breathing apparatus and full protective clothing. Contain Collection Systems: Skim; Pump (as appropriate) Do not burn Shut off all sources of ignition. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	COMBUSTIBLE Poisonous gases may be produced in fire. Containers may explode in fire. Flashback may occur along vapor trail. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus and full protective clothing. Small fires: extinguish with dry chemical, CO <sub>2</sub> , water spray or foam. Large fires: extinguish with water spray, fog, or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR May be harmful if inhaled or absorbed through the skin. Irritating to eyes, skin, nose, and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed or absorbed through skin. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 4-F(C<sub>6</sub>H<sub>4</sub>)CH<sub>3</sub>  
2.3 IMO/IUN Designation: 3.2/2388  
2.4 DOT ID No.: 2388  
2.5 CAS Registry No.: 352-32-9  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respirator with proper filter, goggles  
3.2 **Symptoms Following Exposure:** INHALATION: Irritation of respiratory system. EYES AND SKIN: Severe irritation. INGESTION: Severe internal damage if swallowed.  
3.3 **Treatment of Exposure:** Get medical aid. INHALATION: Move to fresh air. Remove contaminated clothing. Keep warm and quiet. If breathing has stopped give artificial respiration. EYES AND SKIN: Wash with plenty of water. INGESTION: Give one or two glasses of water or milk. Induce vomiting. Give cathartics.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 105°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Alcohol foam; CO<sub>2</sub>; Dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Toxic fumes of fluoride  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Currently not available  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Currently not available  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 110.13  
9.3 **Boiling Point at 1 atm:** 241.9°F = 116.6°C = 389.8°K  
9.4 **Freezing Point:** -70.2°F = -56.8°C = 216.4°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.0007 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.8 (est)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.77 psia

### NOTES

# 4-FLUOROTOLUENE

FTU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	62.470		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	0 20 40 60 80 100 120 140 160 180 200 220	0.040 0.067 0.112 0.188 0.315 0.529 0.889 1.492 2.510 4.210 7.067 11.869		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.214 0.224 0.234 0.245 0.255 0.265 0.275 0.285 0.295 0.306 0.316 0.326 0.336 0.346 0.356 0.366 0.377 0.387 0.397 0.407 0.417 0.427 0.437 0.448 0.458

# FUMARIC ACID

FUM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Allomaleic acid Boletic acid trans-Butenedioic acid trans-1,2-Ethylenedicarboxylic acid Lichenic acid	Solid  White  Odorless   Sinks and mixes with water.
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Shut off ignition sources. Call fire department.</b> <b>Avoid contact with solid and dust.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Dust cloud may explode if ignited in an enclosed area. Irritating gases may be produced when heated. Extinguish with water, dry chemical, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{HO}_2\text{CCH}=\text{CHCO}_2\text{H}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 9126
- 2.5 CAS Registry No.: 110-17-8
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; gloves; safety glasses; dust cap
- 3.2 **Symptoms Following Exposure:** Inhalation of dust may cause respiratory irritation. Compound is non-toxic when ingested. Prolonged contact with eyes or skin may cause irritation.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air. EYES: flush with water; get medical attention if irritation persists. SKIN: flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Irritating fumes of maleic anhydride may form in fires.
- 4.6 **Behavior in Fire:** Dust presents explosion hazard; knock down dust with water fog.
- 4.7 **Auto Ignition Temperature:** 1364°F (powder)
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 14.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 61%, 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; Purified food grade
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 116.07
- 9.3 **Boiling Point at 1 atm:** Very high
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.635 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** -4,970 Btu/lb = -2,760 cal/g = -116 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# FUMARIC ACID

FUM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.700		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# FURAN

FUR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Divinylene oxide Furfuran Oxacyclopentadiene Oxole Tetrole	Liquid Colorless Mild, pleasant Floats and very slowly mixes with water.
<p><b>AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.</b>                      Avoid inhalation.                      Wear self-contained positive pressure breathing apparatus and full protective clothing.                      Shut off ignition sources. Call fire department.                      Stay upwind and use water spray to "knock down" vapors.                      Notify local health and pollution control agencies.                      Protect water intakes.</p>	
<b>Fire</b>	<p><b>FLAMMABLE</b>                      Flashback along vapor trail may occur.                      Containers may explode in fire.                      Vapor may explode if ignited in an enclosed area.                      Wear self-contained positive pressure breathing apparatus and full protective clothing.                      Extinguish small fires: dry chemicals, CO<sub>2</sub>, water spray, or alcohol foam; large fires: water spray, fog or alcohol foam.                      Combat fires from safe distance or protected location (behind barriers) with unmanned monitor nozzle.                      Cool exposed containers with water.</p>
<b>Exposure</b>	<p>CALL FOR MEDICAL HELP.</p> <p><b>VAPOR</b>                      May be harmful if inhaled.                      Narcotic; may cause dizziness or suffocation.                      Move victim to fresh air.                      If not breathing, give artificial respiration.                      If breathing is difficult, give oxygen.</p> <p><b>LIQUID</b>                      May be harmful if swallowed or absorbed through skin.                      Contact may irritate or burn skin and eyes.                      IF IN EYES OR ON SKIN immediately flush with running water for at least 15 min.; hold eyelids open if necessary.                      Remove and isolate contaminated clothing and shoes at the site.                      If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>
<b>Water Pollution</b>	<p>Effect of low concentrations on aquatic life is unknown.                      May be dangerous if it enters water intakes.                      Notify local health and wildlife officials.                      Notify operators of nearby water intakes.</p>

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula: C<sub>4</sub>H<sub>4</sub>O  
 2.3 IMO/UN Designation: 3.1/2389  
 2.4 DOT ID No.: 2389  
 2.5 CAS Registry No.: 110-00-9  
 2.6 NAERG Guide No.: 127  
 2.7 Standard Industrial Trade Classification: 51569

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.  
 3.2 **Symptoms Following Exposure:** May be harmful if inhaled, swallowed or absorbed through skin. Narcotic; may cause dizziness or suffocation. Contact may irritate or burn skin and eyes.  
 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If victim is unconscious or having convulsions, do nothing except keep victim warm.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** May cause mutagenic effects.  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** -40°F. O.C.; -58°F. C.C.  
 4.2 **Flammable Limits in Air:** 2.3% - 14.3%  
 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or alcohol foam; large fires: water spray, fog or alcohol foam. (Water may be ineffective.)  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Currently not available  
 4.6 **Behavior in Fire:** Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire. Vapor explosion hazard exists indoors, outdoors or in sewers.  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** Currently not available  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** Currently not available  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 2  
 Human Oral hazard: 1  
 Human Contact hazard: -  
 Reduction of amenities: -

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 99+% (Stabilized with 0.0254% 2,6-di-tert-butyl-4-Methylphenol to prevent formation of peroxide).  
 7.2 **Storage Temperature:** Keep cool  
 7.3 **Inert Atmosphere:** Currently not available  
 7.4 **Venting:** Not pertinent  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** I  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	1

8.6 **EPA Reportable Quantity:** 100 pounds  
 8.7 **EPA Pollution Category:** B  
 8.8 **RCRA Waste Number:** U124  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 68.08  
 9.3 **Boiling Point at 1 atm:** 88.3°F. = 31.3°C. = 304°K.  
 9.4 **Freezing Point:** -122.2°F = -85.68°C. = 187.5°K.  
 9.5 **Critical Temperature:** 416.8°F. = 213.8°C. = 487.0°K.  
 9.6 **Critical Pressure:** 772 psia = 52.5 atm = 5.32 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** .9514 at 20°C.  
 9.8 **Liquid Surface Tension:** 24.10 dynes/cm = 0.0241 N/m at 20°C.  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** 2.3 (est.)  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
 9.12 **Latent Heat of Vaporization:** 171.2 Btu/lb = 95.09 cal/g = 3.981 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -12,599 Btu/lb = - 7,000 cal/g = -293 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Currently not available  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# FURAN

FUR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	59.400		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	68	0.380

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	1.000	10 20 30 40 50 60 70 80	1.012 2.129 3.367 4.747 6.296 8.047 10.041 12.334	10 20 30 40 50 60 70 80	0.01298 0.02710 0.04249 0.05936 0.07791 0.09842 0.12122 0.14670	100 125 150 175 200 225 250 275 300 325 350 375 400	0.234 0.252 0.268 0.282 0.295 0.307 0.318 0.328 0.338 0.347 0.355 0.364 0.372

# FLUORINE

FXX

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquefied gas Clear to yellow Very irritating odor  Liquid sinks and boils in water. Poisonous visible vapor cloud is produced.
<p><b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b>                      Avoid inhalation.                      Wear chemical protective suit.                      Evacuate area in case of large discharge.                      Notify local health and pollution control agencies.                      Protect water intakes.</p>	
Fire	Not flammable. WILL CAUSE FIRE AND REACT VIOLENTLY WITH COMBUSTIBLES. POISONOUS GAS IS PRODUCED IN FIRE. Wear chemical protective suit with self-contained breathing apparatus. Combat fires from behind barrier, with unmanned hose holder or monitor nozzle. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Will cause frostbite. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. DO NOT RUB AFFECTED AREAS.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
 2.2 Formula: F<sub>2</sub>  
 2.3 IMO/UN Designation: 2.0/1045  
 2.4 DOT ID No.: 1045  
 2.5 CAS Registry No.: 7782-41-4  
 2.6 NAERG Guide No.: 124  
 2.7 Standard Industrial Trade Classification: 52225

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Tight-fitting chemical goggles; special clothing, not easily ignited by fluorine gas.  
 3.2 **Symptoms Following Exposure:** Severe burning of eyes, skin and respiratory system. The burns may develop slowly after exposure.  
 3.3 **Treatment of Exposure:** Flush all affected parts with water for at least 15 min. Do NOT use ointments. Administer artificial respiration and oxygen if required.  
 3.4 **TLV-TWA:** 1 ppm  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** 2 ppm  
 3.7 **Toxicity by Ingestion:** Not pertinent  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Severe burns may develop slowly after exposure.  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.  
 3.12 **Odor Threshold:** 0.035 ppm  
 3.13 **IDLH Value:** 25 ppm  
 3.14 **OSHA PEL-TWA:** 0.1 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable  
 4.2 **Flammable Limits in Air:** Not flammable  
 4.3 **Fire Extinguishing Agents:** Not pertinent  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not direct water onto fluorine leaks.  
 4.5 **Special Hazards of Combustion Products:** Toxic gases generated in fires involving fluorine.  
 4.6 **Behavior in Fire:** Dangerously reactive gas. Ignites most combustibles.  
 4.7 **Auto Ignition Temperature:** Not flammable  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** Not flammable  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with water to form hydrogen fluoride, oxygen, and oxygen difluoride.  
 5.2 **Reactivity with Common Materials:** Reacts violently with all combustible materials, except the metal cylinders in which it is shipped.  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 2.3 ppm\*/trout/TL<sub>50</sub>/fresh water  
 \*Time period not specified.  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** None  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Safety relief  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison gas  
 8.2 **49 CFR Class:** 2.3  
 8.3 **49 CFR Package Group:** Not pertinent.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 3              |
| Special (White).....      | W              |
- 8.6 **EPA Reportable Quantity:** 10 pounds  
 8.7 **EPA Pollution Category:** A  
 8.8 **RCRA Waste Number:** P056  
 8.9 **EPA FWPCL List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
 9.2 **Molecular Weight:** 37.99  
 9.3 **Boiling Point at 1 atm:** -306°F = -188°C = 85°K  
 9.4 **Freezing Point:** -362°F = -219°C = 54°K  
 9.5 **Critical Temperature:** -199.5°F = -128.6°C = 144.6°K  
 9.6 **Critical Pressure:** 809.7 psia = 55.08 atm = 5.58 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 1.5 at -188°C (liquid)  
 9.8 **Liquid Surface Tension:** Not pertinent  
 9.9 **Liquid Water Interfacial Tension:** Not pertinent  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.362  
 9.12 **Latent Heat of Vaporization:** 71.6 Btu/lb = 39.8 cal/g = 1.67 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** Not pertinent  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** 244.0 cal/g  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# FLUORINE

FXX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S	-305 -300 -295 -290 -285 -280 -275 -270 -265 -260 -255 -250 -245 -240 -235 -230 -225 -220 -215 -210 -205	16.110 21.260 27.590 35.260 44.430 55.280 67.959 82.650 99.509 118.700 140.400 164.699 191.799 221.799 254.799 291.099 330.500 373.399 419.699 469.500 523.000	-305 -300 -295 -290 -285 -280 -275 -270 -265 -260 -255 -250 -245 -240 -235 -230 -225 -220 -215 -210 -205	0.36850 0.47120 0.59290 0.73540 0.90030 1.08900 1.30200 1.54200 1.80900 2.10400 2.42700 2.78000 3.16200 3.57300 4.01400 4.48500 4.98500 5.51400 6.07100 6.65600 7.26800	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.192 0.194 0.195 0.197 0.199 0.200 0.202 0.203 0.205 0.206 0.207 0.209 0.210 0.211 0.212 0.213 0.214 0.215 0.216 0.217 0.218 0.219 0.220 0.220 0.221

# GLYOXYLIC ACID (50% OR LESS)

GAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Formyl formic acid Oxacetic acid Oxoethanoic acid		Liquid  Colorless to straw yellow
Wear full impervious protective clothing and approved respirator. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable. Cool exposed containers with water to avoid overheating. Avoid direct contact of water with acid to reduce splattering and overheating.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush skin with water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: OHCCOOH  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 298-12-4  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51392

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear full impervious protective clothing and approved respirator. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Contact will cause severe eye and skin burns. Vapor exposure may cause eye and skin irritation.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water. INGESTION: Dilute with milk, lime water, or aluminum hydroxide.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable.  
4.2 **Flammable Limits in Air:** Not pertinent.  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide or water spray.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Avoid direct contact between water and acid.  
4.5 **Special Hazards of Combustion Products:** Not pertinent.  
4.6 **Behavior in Fire:** Not pertinent.  
4.7 **Auto Ignition Temperature:** Not pertinent.  
4.8 **Electrical Hazards:** Not pertinent.  
4.9 **Burning Rate:** Not pertinent.  
4.10 **Adiabatic Flame Temperature:** Not pertinent.  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Not pertinent.  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** May generate heat.  
5.2 **Reactivity with Common Materials:** Will react with base metals to release hydrogen gas.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Lime.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Varying concentrations available.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 74.04  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.342  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# GLYOXYLIC ACID (50% OR LESS)

GAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# GASOLINE BLENDING STOCKS: ALKYLATES

GAK

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Watery liquid	Colorless	Gasoline odor
Floats on water. Flammable, irritating vapor is produced.			
<div>Evacuate.</div> <div>Keep people away.</div> <div>Wear chemical protective suit with self-contained breathing apparatus.</div> <div>Shut off ignition sources and call fire department.</div> <div>Stay upwind and use water spray to "knock down" vapor.</div> <div>Notify local health and pollution control agencies.</div> <div>Protect water intakes.</div>			
Fire	<div>FLAMMABLE.</div> <div>Flashback along vapor trail may occur.</div> <div>Vapor may explode if ignited in an enclosed area.</div> <div>Extinguish with dry chemical, foam, or carbon dioxide.</div> <div>Water may be ineffective on fire.</div> <div>Cool exposed containers with water.</div>		
Exposure	<div>CALL FOR MEDICAL AID.</div> <div>VAPOR</div> <div>Irritating to eyes, nose and throat.</div> <div>If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.</div> <div>Move to fresh air.</div> <div>If breathing has stopped, give artificial respiration.</div> <div>If breathing is difficult, give oxygen.</div> <div>LIQUID</div> <div>Irritating to skin and eyes.</div> <div>If swallowed, will cause nausea and vomiting.</div> <div>Remove contaminated clothing and shoes.</div> <div>Flush affected areas with plenty of water.</div> <div>IF IN EYES, hold eyelids open and flush with plenty of water.</div> <div>IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</div> <div>DO NOT INDUCE VOMITING.</div>		
Water Pollution	<div>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</div> <div>Fouling to shoreline.</div> <div>May be dangerous if it enters water intakes.</div> <div>Notify local health and wildlife officials.</div> <div>Notify operators of nearby water intakes.</div>		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not pertinent  
2.3 IMO/UN Designation: 3.1, 3.2/1203  
2.4 DOT ID No.: 1203  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 33411

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Protective goggles, gloves.  
3.2 Symptoms Following Exposure: INHALATION causes irritation of upper respiratory tract; central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest; irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach; stimulation followed by depression of central nervous system; irregular heartbeat.  
3.3 Treatment of Exposure: Seek medical attention. INHALATION: maintain respiration; give oxygen if needed. ASPIRATION: enforce bed rest; administer oxygen. INGESTION: do NOT induce vomiting; lavage carefully if appreciable quantity was ingested; guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 Odor Threshold: 0.25 ppm  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:  
(a) <0°F C.C. (b) 0–73°F C.C.  
4.2 Flammable Limits in Air: (a) 1.1%–8.7%  
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
4.5 Special Hazards of Combustion Products: None  
4.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Class I, group D  
4.9 Burning Rate: 4 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
90 ppm/24 hr/juvenile American shad/TL<sub>w</sub>/fresh water  
91 ppm/24 hr/juvenile American shad/TL<sub>w</sub>/salt water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 8%, 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Composition varies with range of distillation temperatures used.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester) or pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: 58–275°F = 14–135°C = 287–408°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.71–0.75 at 15°C (liquid)  
9.8 Liquid Surface Tension: 19–23 dynes/cm = 0.019–0.023 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: 49–51 dynes/cm = 0.049–0.051 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: 3.4  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: 130–150 Btu/lb = 71–81 cal/g = 3.0–3.4 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: –18,720 Btu/lb = –10,400 cal/g = –435.4 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# GASOLINE BLENDING STOCKS: ALKYLATES

GAK

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	45.040	10	0.459	40	0.909	46	0.494
40	44.880	15	0.462	50	0.900	48	0.487
45	44.730	20	0.464	60	0.891	50	0.481
50	44.570	25	0.467	70	0.883	52	0.475
55	44.410	30	0.470	80	0.874	54	0.469
60	44.260	35	0.472	90	0.865	56	0.463
65	44.100	40	0.475	100	0.856	58	0.457
70	43.950	45	0.478	110	0.847	60	0.451
75	43.790	50	0.480	120	0.838	62	0.445
80	43.630	55	0.483	130	0.829	64	0.440
85	43.480	60	0.486	140	0.821	66	0.434
90	43.320	65	0.488	150	0.812	68	0.429
95	43.160	70	0.491	160	0.803	70	0.424
100	43.010	75	0.493	170	0.794	72	0.419
105	42.850	80	0.496	180	0.785	74	0.414
110	42.700	85	0.499	190	0.776	76	0.409
115	42.540	90	0.501			78	0.404
120	42.380	95	0.504			80	0.399
125	42.230	100	0.507			82	0.395
130	42.070	105	0.509			84	0.390
135	41.920					86	0.386
140	41.760					88	0.381
145	41.600					90	0.377
150	41.450					92	0.373
155	41.290					94	0.369
160	41.140					96	0.365

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# GASOLINES: AUTOMOTIVE (<4.23G LEAD/GAL)

GAT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Motor spirit Petrol	Watery liquid  Colorless to pale brown or pink  Gasoline odor  Floats on water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Wear chemical protective suit with self-contained breathing apparatus. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: (Mixture of hydrocarbons)  
2.3 IMO/UN Designation: 3.1/1203  
2.4 DOT ID No.: 1203  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 33411

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective goggles, gloves.  
3.2 **Symptoms Following Exposure:** Irritation of mucous membranes and stimulation followed by depression of central nervous system. Breathing of vapor may also cause dizziness, headache, and incoordination or, in more severe cases, anesthesia, coma, and respiratory arrest. If liquid enters lungs, it will cause severe irritation, coughing, gagging, pulmonary edema, and, later, signs of bronchopneumonia and pneumonitis. Swallowing may cause irregular heartbeat.  
3.3 **Treatment of Exposure:** INHALATION: maintain respiration and administer oxygen; enforce bed rest if liquid is in lungs. INGESTION: do NOT induce vomiting; stomach should be lavaged (by doctor) if appreciable quantity is swallowed. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.  
3.4 **TLV-TWA:** 300 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 500 ppm  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.25 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -36°F C.C.  
4.2 **Flammable Limits in Air:** 1.4%-7.4%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** None  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 853°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 12.0%; CO<sub>2</sub> diluent: 14.5-15.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Cautistics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
90 ppm/24 hr/juvenile American shad/TL<sub>50</sub>/fresh water  
91 mg/1/24 hr/juvenile American shad/TL<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 8%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Various octane ratings; military specifications  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 140–390°F = 60–199°C = 333–472°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.7321 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 19-23 dynes/cm = 0.019–0.023 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 49-51 dynes/cm = 0.049–0.051 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.4 (est.) 1.054  
9.12 **Latent Heat of Vaporization:** 130–150 Btu/lb = 71–81 cal/g = 3.0 – 3.4 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -18,720 Btu/lb = -10,400 cal/g = 435.1 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 7.4 psia

### NOTES



# GASOLINES: AUTOMOTIVE (<4.23G LEAD/GAL)

GAT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
45	46.270	10	0.459	40	0.909	46	0.521
50	46.130	15	0.462	50	0.900	48	0.514
55	46.000	20	0.464	60	0.891	50	0.507
60	45.850	25	0.467	70	0.883	52	0.500
65	45.710	30	0.470	80	0.874	54	0.494
70	45.560	35	0.472	90	0.865	56	0.487
75	45.400	40	0.475	100	0.856	58	0.481
80	45.240	45	0.478	110	0.847	60	0.475
85	45.080	50	0.480	120	0.838	62	0.469
90	44.910	55	0.483	130	0.829	64	0.463
95	44.750	60	0.486	140	0.821	66	0.457
100	44.570	65	0.488	150	0.812	68	0.451
105	44.390	70	0.491	160	0.803	70	0.446
110	44.210	75	0.494	170	0.794	72	0.440
115	44.030	80	0.496	180	0.785	74	0.435
		85	0.499	190	0.776	76	0.430
		90	0.502			78	0.424
		95	0.504			80	0.419
		100	0.507			82	0.414
		105	0.510			84	0.410
						86	0.405
						88	0.400
						90	0.396
						92	0.391
						94	0.387
						96	0.382

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# GASOLINES: AVIATION (< 4.86G LEAD/GAL)

GAV

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Watery liquid      Red, blue, green, brown or purple      Gasoline odor

Floats on water. Flammable, irritating vapor is produced.

Evacuate.  
Keep people away.  
Wear chemical protective suit with self-contained breathing apparatus.  
Shut off ignition sources and call fire department.  
Stay upwind and use water spray to "knock down" vapor.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

FLAMMABLE.  
Flashback along vapor trail may occur.  
Vapor may explode if ignited in an enclosed area.  
Extinguish with dry chemical, foam or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.

VAPOR  
Irritating to eyes, nose and throat.  
If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

LIQUID  
Irritating to skin and eyes.  
If swallowed, will cause nausea or vomiting.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
DO NOT INDUCE VOMITING.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Not pertinent  
2.3 IMO/UN Designation: 3.1/1203  
2.4 DOT ID No.: 1203  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 33411

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective goggles, gloves.
- 3.2 **Symptoms Following Exposure:** INHALATION causes irritation of upper respiratory tract; central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest; irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach; stimulation followed by depression of central nervous system; irregular heartbeat.
- 3.3 **Treatment of Exposure:** Seek medical attention. INHALATION: maintain respiration; give oxygen if needed. ASPIRATION: enforce bed rest; administer oxygen. INGESTION: do NOT induce vomiting; lavage carefully if appreciable quantity was ingested; guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.
- 3.4 TLV-TWA: 300 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 500 ppm  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 Odor Threshold: 0.25 ppm  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: -50°F C.C.  
4.2 Flammable Limits in Air: 1.2%-7.1%  
4.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
4.5 Special Hazards of Combustion Products: None  
4.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
4.7 Auto Ignition Temperature: 824°F  
4.8 Electrical Hazards: Class I, group D  
4.9 Burning Rate: 4 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
90 ppm/24 hr/juvenile American shad/TL<sub>50</sub>/fresh water  
91 ppm/24 hr/juvenile American shad/TL<sub>50</sub>/salt water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 8%, 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: +  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Grades 80/87, 100/130, and 115/145: Specification MIL-G-5572e  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester) or pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed.  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: 160–340°F = 71–171°C = 344–444°K  
9.4 Freezing Point: <76°F = <24.4°C = <297.6°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.711 at 15°C (liquid)  
9.8 Liquid Surface Tension: 19–23 dynes/cm = 0.019–0.023 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: 49–51 dynes/cm = 0.049–0.051 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: 3.4  
9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.054  
9.12 Latent Heat of Vaporization: 130–150 Btu/lb = 71–81 cal/g = 3.0–3.4 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -18,720 Btu/lb = -10,400 cal/g = -435.4 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# GASOLINES: AVIATION (< 4.86G LEAD/GAL)

GAV

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	45.040	10	0.466	40	0.909	35	0.519
40	44.880	15	0.468	50	0.900	40	0.501
45	44.730	20	0.471	60	0.891	45	0.485
50	44.570	25	0.474	70	0.883	50	0.469
55	44.410	30	0.476	80	0.874	55	0.454
60	44.260	35	0.479	90	0.865	60	0.440
65	44.100	40	0.482	100	0.856	65	0.426
70	43.950	45	0.484	110	0.847	70	0.414
75	43.790	50	0.487	120	0.838	75	0.401
80	43.630	55	0.490	130	0.829	80	0.390
85	43.480	60	0.492	140	0.821	85	0.379
90	43.320	65	0.495	150	0.812	90	0.368
95	43.160	70	0.498	160	0.803	95	0.358
100	43.010	75	0.500	170	0.794	100	0.348
105	42.850	80	0.503	180	0.785	105	0.339
110	42.700	85	0.506	190	0.776	110	0.330
115	42.540	90	0.508			115	0.322
120	42.380	95	0.511			120	0.314
125	42.230	100	0.514			125	0.306
130	42.070	105	0.516			130	0.299
135	41.920					135	0.291
140	41.760					140	0.285
145	41.600					145	0.278
150	41.450					150	0.272
155	41.290					155	0.266
160	41.140					160	0.260

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# GLYCIDYL METHACRYLATE

GCM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Glycidyl alpha-methyl acrylate Methacrylic acid, 2, 3-epoxypropyl ester	Liquid	Colorless	Fruity odor
Floats on water.			
Keep people away. Avoid contact with liquid. Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_2=\text{CH}(\text{CH}_2)\text{COOCH}_2\text{CHCH}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 106-91-2  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51373

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Polyethylene-coated apron and gloves and close-fitting goggles.
- 3.2 **Symptoms Following Exposure:** The liquid irritates eyes about as much as soap. Prolonged contact with skin produces irritation and dermatitis.
- 3.3 **Treatment of Exposure:** SKIN: wash thoroughly with soap and water and treat as a chemical burn.  
EYES: irrigate with clear water for 15 min. and get medical attention.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure. In eyes the irritation is similar to that caused by ordinary soap.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 183°F O.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Currently not available
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 39.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Heat, peroxides, and caustics all cause polymerization; the reaction is not considered hazardous.
- 5.6 **Inhibitor of Polymerization:** Hydroquinone monomethyl ether: 50 ppm

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 92%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement 10.4 Open (flame arrester)
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 142.2
- 9.3 **Boiling Point at 1 atm:** Very high
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.073 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.043
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -10,800 Btu/lb = -5,980 cal/g = -250 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** (est.) -900 Btu/lb = -500 cal/g = -20 X 10<sup>5</sup> J/kg
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# GLYCIDYL METHACRYLATE

GCM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	66.980	85	0.426	50	1.040	50	9.343
52	66.980	90	0.430	52	1.040	52	8.841
54	66.980	95	0.434	54	1.040	54	8.370
56	66.980	100	0.438	56	1.040	56	7.927
58	66.980	105	0.442	58	1.040	58	7.511
60	66.980	110	0.446	60	1.040	60	7.119
62	66.980	115	0.451	62	1.040	62	6.751
64	66.980	120	0.455	64	1.040	64	6.404
66	66.980	125	0.459	66	1.040	66	6.078
68	66.980	130	0.463	68	1.040	68	5.770
70	66.980	135	0.467	70	1.040	70	5.481
72	66.980	140	0.471	72	1.040	72	5.207
74	66.980	145	0.476	74	1.040	74	4.950
76	66.980	150	0.480	76	1.040	76	4.707
78	66.980			78	1.040	78	4.477
80	66.980			80	1.040	80	4.260
82	66.980			82	1.040	82	4.056
84	66.980			84	1.040	84	3.862

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I		C		N	90	0.336
	N		U		O	100	0.336
	S		R		T	110	0.336
	O		R			120	0.336
	L		E		P	130	0.336
	U		N		E	140	0.336
	B		T		R	150	0.336
	I		L		T	160	0.336
	E		Y		I	170	0.336
					N	180	0.336
			N		E	190	0.336
			O		N	200	0.336
			T		T	210	0.336
						220	0.336
			A			230	0.336
			V			240	0.336
			A			250	0.336
			I			260	0.336
			L				
			A				
			B				
			L				
			E				

# GLYCERINE

GCR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Glycerol 1,2,3-Propanetriol 1,2,3-Trihydroxypropane	Oily liquid	Colorless	Odorless
Sinks and mixes with water. Freezing point is 64°F.			
Call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	Not harmful.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 20; Alcohols, glycols
- 2.2 **Formula:** HOCH<sub>2</sub>CH(OH)CH<sub>2</sub>OH
- 2.3 **IMO/UN Designation:** Not listed
- 2.4 **DOT ID No.:** Not listed
- 2.5 **CAS Registry No.:** 56-81-5
- 2.6 **NAERG Guide No.:** Not listed
- 2.7 **Standard Industrial Trade Classification:** 51222

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, goggles.
- 3.2 **Symptoms Following Exposure:** No hazard
- 3.3 **Treatment of Exposure:** No hazard
- 3.4 **TLV-TWA:** 10 mg/m<sup>3</sup> (mist)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> above 15 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** 15 mg/m<sup>3</sup> total dust; 5 mg/m<sup>3</sup> respirable fraction.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 350°F O.C. 320°F C.C.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide, water fog
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 698°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 0.9 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 16.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 20% (theor.), 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 0
  - Human Oral hazard: 0
  - Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** CP: 99.5%; USP: 96%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester) or pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 92.10
- 9.3 **Boiling Point at 1 atm:** 554°F = 290°C = 563°K
- 9.4 **Freezing Point:** 64.2°F = 17.9°C = 291.1°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.261 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** 288 Btu/lb = 160 cal/g = 6.70 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -7758 Btu/lb = -4310 cal/g = -180.5 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 47.95 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Very low

### NOTES

# GLYCERINE

GCR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
70	78.709	70	0.623	65	1.977		N O T
80	78.500	80	0.629	70	1.978		
90	78.290	90	0.635	75	1.980		
100	78.080	100	0.641	80	1.981		P E R T I N E N T
110	77.860	110	0.647	85	1.983		
120	77.641	120	0.653	90	1.984		
130	77.410	130	0.659	95	1.986		
140	77.179	140	0.665	100	1.987		
150	76.940	150	0.671	105	1.989		
160	76.709	160	0.677	110	1.990		
170	76.459	170	0.683	115	1.992		
180	76.219	180	0.689	120	1.994		
190	75.969	190	0.695	125	1.995		
200	75.721	200	0.701	130	1.997		
210	75.459	210	0.707	135	1.998		
		220	0.713	140	2.000		
		230	0.719	145	2.001		
		240	0.725	150	2.003		
		250	0.731	155	2.004		
		260	0.737	160	2.006		
		270	0.743	165	2.007		
		280	0.749	170	2.009		
				175	2.010		
				180	2.012		
				185	2.014		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	150	0.001		N O T		N O T
		160	0.001				
		170	0.001				
		180	0.002		P E R T I N E N T		P E R T I N E N T
		190	0.003				
		200	0.004				
		210	0.006				
		220	0.009				
		230	0.013				
		240	0.019				
		250	0.027				
		260	0.038				
		270	0.052				
		280	0.072				
		290	0.097				
		300	0.131				
		310	0.176				
		320	0.234				
		330	0.308				

# GASOLINES: CASINGHEAD

GCS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Natural gasoline	Watery liquid  Colorless  Gasoline odor  Floats on water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Wear chemical protective suit with self-contained breathing apparatus. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not pertinent  
2.3 IMO/UN Designation: 3.1/1257  
2.4 DOT ID No.: 1257  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 33411

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective goggles, gloves.  
3.2 **Symptoms Following Exposure:** INHALATION causes irritation of upper respiratory tract; central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest; irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis, acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach; stimulation followed by depression of central nervous system; irregular heartbeat.  
3.3 **Treatment of Exposure:** Seek medical attention. INHALATION: maintain respiration; give oxygen if needed. ASPIRATION: enforce bed rest; administer oxygen. INGESTION: do NOT induce vomiting; lavage carefully if appreciable quantity was ingested; guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.  
3.4 **TLV-TWA:** 300 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 500 ppm  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.25 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** <0°F O.C.  
4.2 **Flammable Limits in Air:** 1.3%-7.1%  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** None  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Class I, group D  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
90 ppm/24 hr/juvenile American shad/TL<sub>w</sub>/fresh water  
91 ppm/24 hr/juvenile American shad/TL<sub>w</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 8%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Composition depends on location of oil well  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 58–275°F = 14–135°C = 287–408°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.671 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** 19–23 dynes/cm = 0.019–0.023 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 49–51 dynes/cm = 0.049–0.051 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 130–150 Btu/lb = 71–81 cal/g = 3.0–3.4 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** –18,720 Btu/lb = –10,400 cal/g = –435.4 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# GASOLINES: CASINGHEAD

GCS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	42.790	10	0.478	40	0.909	35	0.519
40	42.630	15	0.481	50	0.900	40	0.501
45	42.480	20	0.484	60	0.891	45	0.485
50	42.320	25	0.487	70	0.883	50	0.469
55	42.170	30	0.489	80	0.874	55	0.454
60	42.010	35	0.492	90	0.865	60	0.440
65	41.850	40	0.495	100	0.856	65	0.426
70	41.700	45	0.498	110	0.847	70	0.414
75	41.540	50	0.500	120	0.838	75	0.401
80	41.390	55	0.503	130	0.829	80	0.390
85	41.230	60	0.506	140	0.821	85	0.379
90	41.070	65	0.509	150	0.812	90	0.368
95	40.920	70	0.511	160	0.803	95	0.358
100	40.760	75	0.514	170	0.794	100	0.348
105	40.610	80	0.517	180	0.785	105	0.339
110	40.450	85	0.520	190	0.776	110	0.330
115	40.290	90	0.523			115	0.322
120	40.140	95	0.525			120	0.314
125	39.980	100	0.528			125	0.306
130	39.830	105	0.531			130	0.299
135	39.670					135	0.291
140	39.510					140	0.285
145	39.360					145	0.278
150	39.200					150	0.272
155	39.050					155	0.266
160	38.890					160	0.260

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# GALLIC ACID

GLA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Gallic acid monohydrate 3,4,5-Trihydroxybenzoic acid	Solid  White  Odorless  Sinks in water.
Keep people away. Shut off ignition sources. Call fire department. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 3, 4, 5-(HO)<sub>3</sub>C<sub>6</sub>H<sub>2</sub>COOH·H<sub>2</sub>O  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 149-91-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51394

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Bu. Mines approved respirator; rubber gloves; safety goggles  
3.2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Contact with eyes or skin causes irritation.  
3.3 **Treatment of Exposure:** INGESTION: give large amount of water; induce vomiting. EYES: flush with water for at least 10 min.; consult a physician if irritation persists. SKIN: wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 - 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
Not pertinent  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
30-35 ppm/6 hr/minnow/MLD/fresh water  
15-20 ppm/6 hr/minnow/MLD/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 8%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** N.F.; Practical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 188  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.7 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -6,060 Btu/lb = -3,370 cal/g = -141 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# GALLIC ACID

GLA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.150		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# GAS OIL: CRACKED

GOC

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid      Colorless      Gasoline-like odor

Floats on water.

Keep people away.  
Avoid contact with liquid and vapor.  
Wear protective clothing.  
Call fire department.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Combustible.  
Extinguish with dry chemical, foam, or carbon dioxide.

### Exposure

CALL FOR MEDICAL AID.

LIQUID  
Harmful if swallowed.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
DO NOT INDUCE VOMITING.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** Not pertinent (mixture)  
2.3 **IMO/UN Designation:** 3.3/1202 (gas oil)  
2.4 **DOT ID No.:** 1202  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 128  
2.7 **Standard Industrial Trade Classification:** 33430

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective goggles, gloves.  
3.2 **Symptoms Following Exposure:** INHALATION: causes irritation of upper respiratory tract; stimulation, then depression; dizziness, headache, incoordination, anesthesia, coma, respiratory arrest; irregular heartbeat is a complication. ASPIRATION: causes severe coughing, gagging, distress, rapid development of pulmonary edema. INGESTION: causes irritation of throat and stomach; stimulation, then depression.  
3.3 **Treatment of Exposure:** Get medical attention. INHALATION: maintain respiration; administer oxygen if needed. ASPIRATION: enforce bed rest and administer oxygen. INGESTION: give victim water or milk; do NOT induce vomiting; guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: remove by wiping, then wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** 0.25 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 150°F C.C.  
4.2 **Flammable Limits in Air:** 6.0%-13.5%  
4.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide, or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 640°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
90 ppm/24 hr/juvenile shad/TL<sub>50</sub>/fresh water  
91 ppm/24 hr/juvenile shad/TL<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 8%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Composition varies widely with the refinery operation involved.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 375–750°F = 190–399°C = 463–672°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.848 16°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** –18,400 Btu/lb = –10,200 cal/g = 428 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# GAS OIL: CRACKED

GOC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
32	53.860	35	0.421	0	0.927	100	2.750
34	53.790	40	0.423	10	0.925		
36	53.720	45	0.426	20	0.923		
38	53.650	50	0.428	30	0.921		
40	53.580	55	0.431	40	0.919		
42	53.510	60	0.433	50	0.917		
44	53.440	65	0.435	60	0.915		
46	53.380	70	0.438	70	0.913		
48	53.310	75	0.440	80	0.911		
50	53.240	80	0.443	90	0.909		
52	53.170	85	0.445	100	0.907		
54	53.100	90	0.448	110	0.905		
56	53.030	95	0.450	120	0.903		
58	52.960	100	0.453	130	0.901		
60	52.890	105	0.455	140	0.899		
62	52.820			150	0.897		
64	52.750			160	0.895		
66	52.680			170	0.893		
68	52.610			180	0.891		
70	52.540			190	0.889		
72	52.470			200	0.887		
74	52.400			210	0.885		
76	52.340						
78	52.270						
80	52.200						
82	52.130						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# GLYOXAL

GOS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Biformyl Diformyl Ethanedial Oxal Oxaldehyde	Liquid  Mixes with water.	Light yellow	Weak sour odor
<b>Keep people away. Avoid contact with liquid. Wear protective clothing. Notify local health and pollution control agencies. Protect water intakes.</b>			
<b>Fire</b>	Not flammable.		
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 19; Aldehyde  
**2.2 Formula:** CHO CHO (in water)  
**2.3 IMO/UN Designation:** Not listed  
**2.4 DOT ID No.:** Not listed  
**2.5 CAS Registry No.:** 107-22-2  
**2.6 NAERG Guide No.:** Not listed  
**2.7 Standard Industrial Trade Classification:** 51621

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Goggles or face shield, 40% solution; rubber gloves  
**3.2 Symptoms Following Exposure:** Inhalation causes some irritation of nose and, 40% solution throat. Contact with liquid, 40% solution irritates eyes and causes mild irritation of skin; stains skin yellow. (No information available on symptoms of ingestion.)  
**3.3 Treatment of Exposure:** INHALATION: remove from exposure. EYES or SKIN: flood, 40% solution with water for 15 min. INGESTION: no information on treatment.  
**3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grad, 40% solution; 2; oral rat LD<sub>50</sub> = 2,020 mg/kg  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard, 40% solution. If spilled on clothing and allowed to remain, may cause smarting and, 40% solution reddening of the skin.  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** Non-flammable solution  
**4.2 Flammable Limits in Air:** Not pertinent  
**4.3 Fire Extinguishing Agents:** Not pertinent  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Heat may cause polymerization to a combustible, viscous material.  
**4.7 Auto Ignition Temperature:** Not pertinent  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** Not pertinent  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** Corrosive to most metals. The reaction is slow.  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 1  
 Human Oral hazard: 1  
 Human Contact hazard: 1  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 40% in water  
**7.2 Storage Temperature:** 10-120°F  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open  
**7.5 IMO Pollution Category:** D  
**7.6 Ship Type:** Data not available  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed.  
**8.2 49 CFR Class:** Not pertinent  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	
Flammability (Red).....	
Instability (Yellow).....	

 Not listed, 40% solution  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid, 40% solution  
**9.2 Molecular Weight:** Mixture  
**9.3 Boiling Point at 1 atm:** Currently not available  
**9.4 Freezing Point:** 5°F = -15°C = 258°K  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 1.29 at 20°C (liquid, 40% solution)  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Not pertinent  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
**9.12 Latent Heat of Vaporization:** Not pertinent  
**9.13 Heat of Combustion:** Not pertinent  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# GLYOXAL

GOS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	81.110		N O T		N O T		N O T
36	81.070						
38	81.020						
40	80.980						
42	80.940		P		P		P
44	80.900		E		E		E
46	80.860		R		R		R
48	80.820		T		T		T
50	80.770		I		I		I
52	80.730		N		N		N
54	80.690		E		E		E
56	80.650		N		N		N
58	80.610		E		E		E
60	80.570		N		N		N
62	80.520						
64	80.480						
66	80.440						
68	80.400						
70	80.360						
72	80.320						
74	80.270						
76	80.230						
78	80.190						
80	80.150						
82	80.110						
84	80.070						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T		N O T		N O T
			P		P		P
			E		E		E
			R		R		R
			T		T		T
			I		I		I
			N		N		N
			E		E		E
			N		N		N

# GASOLINES: POLYMER

GPL

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Watery liquid

Colorless

Gasoline odor

Floats on water. Flammable, irritating vapor is produced.

Evacuate.  
Keep people away.  
Avoid contact with liquid and vapor.  
Shut off ignition sources and call fire department.  
Stay upwind and use water spray to "knock down" vapor.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

FLAMMABLE.  
Flashback along vapor trail may occur.  
Vapor may explode if ignited in an enclosed area.  
Extinguish with dry chemical, foam, or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.

VAPOR  
Irritating to eyes, nose and throat.  
If inhaled, will cause dizziness, headaches, difficult breathing or loss of consciousness.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

LIQUID  
Irritating to skin and eyes.  
If swallowed, will cause nausea or vomiting.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
DO NOT INDUCE VOMITING.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

### Water Pollution

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not pertinent  
2.3 IMO/UN Designation: 3.2/1215  
2.4 DOT ID No.: 1203  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 33411

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Protective goggles, gloves.
- 3.2 Symptoms Following Exposure: INHALATION: causes irritation of upper respiratory tract; central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest; irregular heartbeat is dangerous complication. ASPRIATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach; stimulation followed by depression of central nervous system; irregular heartbeat.
- 3.3 Treatment of Exposure: Seek medical attention. INHALATION: maintain respiration; give oxygen if needed. ASPIRATION: enforce bed rest; administer oxygen. INGESTION: do NOT induce vomiting; lavage carefully if appreciable quantity was ingested; guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.
- 3.4 TLV-TWA: 300 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 500 ppm  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 Odor Threshold: 0.25 ppm  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: 0-73°F C.C.  
4.2 Flammable Limits in Air: 1.3%-7.1%  
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
4.5 Special Hazards of Combustion Products: None  
4.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Class I, group D  
4.9 Burning Rate: 4 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
90 ppm/24 hr/juvenile American shad/TLV/fresh water  
91 ppm/24 hr/juvenile American shad/TLV/salt water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 8%, 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Composition varies with range of distillation temperatures used. Contains mostly isohexane-isooctane  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester) or pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: 58-275°F = 14-135°C = 287-408°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.71-0.75 at 15°C (liquid)  
9.8 Liquid Surface Tension: 19-23 dynes/cm = 0.019-0.023 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: 49-51 dynes/cm = 0.049-0.051 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: 3.4  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: 130-150 Btu/lb = 71-81 cal/g = 3.0-3.4 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -18,720 Btu/lb = -10,400 cal/g = -435.4 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES



# GASOLINES: POLYMER

GPL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	45.040	10	0.459	40	0.909	35	0.519
40	44.880	15	0.462	50	0.900	40	0.501
45	44.730	20	0.464	60	0.891	45	0.485
50	44.570	25	0.467	70	0.883	50	0.469
55	44.410	30	0.470	80	0.874	55	0.454
60	44.260	35	0.472	90	0.865	60	0.440
65	44.100	40	0.475	100	0.856	65	0.426
70	43.950	45	0.478	110	0.847	70	0.414
75	43.790	50	0.480	120	0.838	75	0.401
80	43.630	55	0.483	130	0.829	80	0.390
85	43.480	60	0.486	140	0.821	85	0.379
90	43.320	65	0.488	150	0.812	90	0.368
95	43.160	70	0.491	160	0.803	95	0.358
100	43.010	75	0.493	170	0.794	100	0.348
105	42.850	80	0.496	180	0.785	105	0.339
110	42.700	85	0.499	190	0.776	110	0.330
115	42.540	90	0.501			115	0.322
120	42.380	95	0.504			120	0.314
125	42.230	100	0.507			125	0.306
130	42.070	105	0.509			130	0.299
135	41.920					135	0.291
140	41.760					140	0.285
145	41.600					145	0.278
150	41.450					150	0.272
155	41.290					155	0.266
160	41.140					160	0.260

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# GASOLINE BLENDING STOCKS: REFORMATES

GRF

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Watery liquid      Colorless      Gasoline odor

Floats on water. Flammable, irritating vapor is produced.

Evacuate.  
Keep people away.  
Avoid contact with liquid and vapor.  
Shut off ignition sources and call fire department.  
Stay upwind and use water spray to "knock down" vapor.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

FLAMMABLE.  
Flashback along vapor trail may occur.  
Vapor may explode if ignited in an enclosed area.  
Extinguish with dry chemical, foam or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.

VAPOR  
Irritating to eyes, nose and throat.  
If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

LIQUID  
Irritating to skin and eyes.  
If swallowed, will cause nausea or vomiting.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
DO NOT INDUCE VOMITING.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not pertinent  
2.3 IMO/UN Designation: 3.1, 3.2/1203  
2.4 DOT ID No.: 1203  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 33411

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective goggles, gloves.
- 3.2 **Symptoms Following Exposure:** INHALATION causes irritation of upper respiratory tract; central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest; irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach; stimulation followed by depression of central nervous system; irregular heartbeat.
- 3.3 **Treatment of Exposure:** Seek medical attention. INHALATION: maintain respiration; give oxygen if needed. ASPIRATION: enforce bed rest; administer oxygen. INGESTION: do NOT induce vomiting; lavage carefully if appreciable quantity was ingested; guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.
- 3.4 TLV-TWA: 300 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 500 ppm  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 Odor Threshold: 0.25 ppm  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: (a) <0°F C.C. (b) 0-73°F C.C.  
4.2 Flammable Limits in Air: (a) 1.1%-8.7%  
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
4.5 Special Hazards of Combustion Products: None  
4.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Class I, group D  
4.9 Burning Rate: 4 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 90 ppm/24 hr/juvenile American shad/TL<sub>w</sub>/fresh water  
91 ppm/24 hr/juvenile American shad/TL<sub>w</sub>/salt water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 8%, 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Composition varies with range of distillation temperatures used  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester) or pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  
Category      Classification  
Health Hazard (Blue)..... 1  
Flammability (Red)..... 3  
Instability (Yellow)..... 0  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: 58-275°F = 14-135°C = 287-408°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.7934 at 20°C (liquid)  
9.8 Liquid Surface Tension: 19-23 dynes/cm = 0.019-0.023 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: 49-51 dynes/cm = 0.049-0.051 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: 3.4  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: 130-150 Btu/lb = 71-81 cal/g = 3.0-3.4 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -18,720 Btu/lb = -10,400 cal/g = -435.4 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# GASOLINE BLENDING STOCKS: REFORMATES

GRF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
45	50.010	0	0.498	40	0.909	46	0.601
50	49.890	5	0.500	50	0.900	48	0.592
55	49.760	10	0.502	60	0.891	50	0.584
60	49.640	15	0.504	70	0.883	52	0.575
65	49.510	20	0.507	80	0.874	54	0.567
70	49.390	25	0.509	90	0.865	56	0.559
75	49.260	30	0.511	100	0.856	58	0.551
80	49.140	35	0.513	110	0.847	60	0.543
85	49.020	40	0.516	120	0.838	62	0.535
90	48.890	45	0.518	130	0.829	64	0.528
95	48.770	50	0.520	140	0.821	66	0.521
100	48.640	55	0.522	150	0.812	68	0.514
105	48.520	60	0.524	160	0.803	70	0.507
110	48.400	65	0.527	170	0.794	72	0.500
115	48.270	70	0.529	180	0.785	74	0.493
		75	0.531	190	0.776	76	0.487
		80	0.533			78	0.480
		85	0.536			80	0.474
		90	0.538			82	0.468
		95	0.540			84	0.462
		100	0.542			86	0.456
		105	0.544			88	0.450
		110	0.547			90	0.444
		115	0.549			92	0.439
		120	0.551			94	0.433
		125	0.553			96	0.428

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# GASOLINES: STRAIGHT RUN

GSR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Watery liquid      Colorless      Gasoline odor  Floats on water. Flammable, irritating vapor is produced.
	Evacuate. Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
<b>Exposure</b>	VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Chemical and Physical Treatment: Burn Salvage waterfowl	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 33; Miscellaneous Hydrocarbon Mixtures <b>2.2 Formula:</b> Not pertinent <b>2.3 IMO/UN Designation:</b> 3.1, 3.2/1203 <b>2.4 DOT ID No.:</b> 1203 <b>2.5 CAS Registry No.:</b> Currently not available <b>2.6 NAERG Guide No.:</b> 128 <b>2.7 Standard Industrial Trade Classification:</b> 33411
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Protective goggles, gloves. <b>3.2 Symptoms Following Exposure:</b> INHALATION causes irritation of upper respiratory tract; central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest; irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach; stimulation followed by depression of central nervous system; irregular heartbeat. <b>3.3 Treatment of Exposure:</b> Seek medical attention. INHALATION: maintain respiration; give oxygen if needed. ASPIRATION: enforce bed rest; administer oxygen. INGESTION: do NOT induce vomiting; lavage carefully if appreciable quantity was ingested; guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water. <b>3.4 TLV-TWA:</b> 300 ppm <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> 500 ppm <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> None <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. <b>3.12 Odor Threshold:</b> 0.25 ppm <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:**  
(a) <0°F C.C. (b) 0-73°F C.C.
- 4.2 Flammable Limits in Air:** (a) 1.3%-7.1%
- 4.3 Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective
- 4.5 Special Hazards of Combustion Products:** None
- 4.6 Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
- 4.7 Auto Ignition Temperature:** Currently not available
- 4.8 Electrical Hazards:** Class I, group D
- 4.9 Burning Rate:** 4 mm/min.
- 4.10 Adiabatic Flame Temperature:** Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 Flame Temperature:** Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction
- 5.2 Reactivity with Common Materials:** No reaction
- 5.3 Stability During Transport:** Stable
- 5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 Polymerization:** Not pertinent
- 5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
90 ppm/24 hr/juvenile American shad/TL<sub>m</sub>/fresh water  
91 ppm/24 hr/juvenile American shad/TL<sub>m</sub>/salt water
- 6.2 Waterfowl Toxicity:** Currently not available
- 6.3 Biological Oxygen Demand (BOD):** 8%, 5 days
- 6.4 Food Chain Concentration Potential:** None
- 6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Composition varies with range of distillation temperatures used.
- 7.2 Storage Temperature:** Ambient
- 7.3 Inert Atmosphere:** No requirement
- 7.4 Venting:** Open (flame arrester) or pressure-vacuum
- 7.5 IMO Pollution Category:** Currently not available
- 7.6 Ship Type:** Currently not available
- 7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid
- 8.2 49 CFR Class:** 3
- 8.3 49 CFR Package Group:** II
- 8.4 Marine Pollutant:** Yes
- 8.5 NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity:** Not listed.
- 8.7 EPA Pollution Category:** Not listed.
- 8.8 RCRA Waste Number:** Not listed
- 8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid
- 9.2 Molecular Weight:** Not pertinent
- 9.3 Boiling Point at 1 atm:** 58-275°F = 14-135°C = 287-408°K
- 9.4 Freezing Point:** Not pertinent
- 9.5 Critical Temperature:** Not pertinent
- 9.6 Critical Pressure:** Not pertinent
- 9.7 Specific Gravity:** 0.71-0.747 at 15°C (liquid)
- 9.8 Liquid Surface Tension:** 19-23 dynes/cm = 0.019-0.023 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension:** 49-51 dynes/cm = 0.049-0.051 N/m at 20°C
- 9.10 Vapor (Gas) Specific Gravity:** 3.4
- 9.11 Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 Latent Heat of Vaporization:** 130-150 Btu/lb = 71-81 cal/g = 3.0-3.4 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion:** -18,720 Btu/lb = -10,400 cal/g = -435.4 X 10<sup>5</sup> J/kg
- 9.14 Heat of Decomposition:** Not pertinent
- 9.15 Heat of Solution:** Not pertinent
- 9.16 Heat of Polymerization:** Not pertinent
- 9.17 Heat of Fusion:** Currently not available
- 9.18 Limiting Value:** Currently not available
- 9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# GASOLINES: STRAIGHT RUN

GSR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	45.040	10	0.459	40	0.909	35	0.519
40	44.880	15	0.462	50	0.900	40	0.501
45	44.730	20	0.464	60	0.891	45	0.485
50	44.570	25	0.467	70	0.883	50	0.469
55	44.410	30	0.470	80	0.874	55	0.454
60	44.260	35	0.472	90	0.865	60	0.440
65	44.100	40	0.475	100	0.856	65	0.426
70	43.950	45	0.478	110	0.847	70	0.414
75	43.790	50	0.480	120	0.838	75	0.401
80	43.630	55	0.483	130	0.829	80	0.390
85	43.480	60	0.486	140	0.821	85	0.379
90	43.320	65	0.488	150	0.812	90	0.368
95	43.160	70	0.491	160	0.803	95	0.358
100	43.010	75	0.493	170	0.794	100	0.348
105	42.850	80	0.496	180	0.785	105	0.339
110	42.700	85	0.499	190	0.776	110	0.330
115	42.540	90	0.501			115	0.322
120	42.380	95	0.504			120	0.314
125	42.230	100	0.507			125	0.306
130	42.070	105	0.509			130	0.299
135	41.920					135	0.291
140	41.760					140	0.285
145	41.600					145	0.278
150	41.450					150	0.272
155	41.290					155	0.266
160	41.140					160	0.260

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# GLUTARALDEHYDE SOLUTION

GTA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,5-Pentanedial	Liquid Light yellow  Mixes with water.
Keep people away. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 19: Aldehyde
- 2.2 Formula:  $\text{OHC}-(\text{CH}_2)_4-\text{CHO}$  (in water)
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 111-30-8
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Contact with liquid causes severe irritation of eyes and irritation of skin. Chemical readily penetrates skin in harmful amounts. Ingestion causes irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** EYES: immediately flush with plenty of water for at least 15 min.; get medical attention. SKIN: immediately flush with plenty of water for at least 15 min. INGESTION: give large amounts of water and induce vomiting; get medical attention.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 0.05 ppm
- 3.7 **Toxicity by Ingestion:** Grade 2; oral rat  $\text{LD}_{50} = 2,380 \text{ mg/kg}$
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Induces contact dermatitis in some people
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Non-flammable solution
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 1
  - Human Oral hazard: 2
  - Human Contact hazard: II
  - Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 25% aqueous solution; 50% aqueous solution
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Mixture
- 9.3 **Boiling Point at 1 atm:**  $>212^{\circ}\text{F} = >100^{\circ}\text{C} = >373^{\circ}\text{K}$
- 9.4 **Freezing Point:**  $<20^{\circ}\text{F} = <-7^{\circ}\text{C} = <266^{\circ}\text{K}$
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.062–1.124 at  $20^{\circ}\text{C}$  (liquid)
- 9.8 **Liquid Surface Tension:** (est.)  $<80 \text{ dynes/cm} = <0.080 \text{ N/m}$  at  $20^{\circ}\text{C}$
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# GLUTARALDEHYDE SOLUTION

GTA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	68.610	34	0.700		N O T  P E R T I N E N T	68	4.500
40	68.530	36	0.700				
45	68.440	38	0.700				
50	68.349	40	0.700				
55	68.270	42	0.700				
60	68.179	44	0.700				
65	68.089	46	0.700				
70	68.009	48	0.700				
75	67.919	50	0.700				
80	67.830	52	0.700				
85	67.750	54	0.700				
90	67.660	56	0.700				
95	67.570	58	0.700				
100	67.490	60	0.700				
		62	0.700				
		64	0.700				
		66	0.700				
		68	0.700				
		70	0.700				
		72	0.700				
		74	0.700				
		76	0.700				
		78	0.700				
		80	0.700				
		82	0.700				
		84	0.700				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# HEXADECYLTRIMETHYLAMMONIUM CHLORIDE

HAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cetyltrimethylammonium chloride solution	Liquid	Clear to pale yellow	Rubbing alcohol odor
Floats or sinks in water.			
<p>Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to knock down vapor. Notify local health and pollution control agencies. Protect water intakes.</p>			
<b>Fire</b>	FLAMMABLE. Irritating gases may be produced when heated. Flashback vapor along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{16}H_{33}(CH_3)_3NCH_2CH_2O-(CH_2)_2CHOH$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51481

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves  
3.2 Symptoms Following Exposure: Ingestion may produce toxic effects. Contact with eyes or skin may cause severe damage.  
3.3 Treatment of Exposure: INGESTION: do NOT induce vomiting; drink large quantities of fluid and call a physician immediately. EYES: flush with water for at least 15 min. and call a physician. SKIN: flush with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3;  $LD_{50} = 250$  mg/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 69°F C.C.  
(for isopropyl alcohol solutions only)  
4.2 Flammable Limits in Air: 2%-12%  
(isopropyl alcohol)  
4.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
4.5 Special Hazards of Combustion Products: Irritating fumes of hydrogen chloride may form in fires.  
4.6 Behavior in Fire: Solvent vapors are heavier than air and may travel to a source of ignition and flash back.  
4.7 Auto Ignition Temperature: 750°F  
(isopropyl alcohol)  
4.8 Electrical Hazards: (for isopropyl alcohol) Class 1, Group D  
4.9 Burning Rate: (isopropyl alcohol solutions) 2.3 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 144.0 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 61.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 25% solution in water; 50% solution in a mixture of isopropyl alcohol and water, which is flammable. If the chemical (or a solution with concentration greater than 50%) is shipped, contact with skin and eyes should be avoided.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 319 (solute only)  
9.3 Boiling Point at 1 atm: (isopropyl alcohol) 180°F = 82.3°C = 355.5°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: (approx.) 0.9 at 25°C (liquid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES



# HEXADECYLTRIMETHYLAMMONIUM CHLORIDE

HAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	56.180		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# HEXYL ACETATE

HAE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, hexyl ester 1-Hexyl acetate n-Hexyl acetate Hexyl alcohol, acetate Hexyl ethanoate	Liquid  Colorless
<b>Keep people away. Call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	COMBUSTIBLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective on fire. Wear self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be harmful. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula: CH<sub>3</sub>CO<sub>2</sub>C<sub>6</sub>H<sub>13</sub>  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 142-92-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots and heavy rubber gloves.  
3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion, or skin absorption. May cause irritation.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES - OR - SKIN: Flush with copious amounts of water for at least 15 minutes.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> = 42 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available.  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 99°F  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may not be effective.  
4.5 **Special Hazards of Combustion Products:** Vapor may travel considerable distance to a source of ignition and flash back. Container explosion may occur under fire conditions. Forms explosive mixtures in air.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Not pertinent.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 144.21  
9.3 **Boiling Point at 1 atm:** 334.4-338°F = 168-170°C = 441-443.2°K  
9.4 **Freezing Point:** -112°F = -80°C = 193.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.876  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.97  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# HEXYL ACETATE

HAE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.294 0.306 0.318 0.330 0.341 0.353 0.364 0.375 0.385 0.396 0.407 0.417 0.427 0.437 0.447 0.456 0.466 0.475 0.484 0.493 0.502 0.511 0.519 0.528 0.536

# 2-HYDROXYETHYL ACRYLATE

HAI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> HEA beta-Hydroxyethyl acrylate 2-Hydroxyethyl 2-propenoate	Liquid  Colorless  Sweet pleasant odor  Mixes with water.
Keep people away. Avoid contact with liquid and vapor. Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Containers may explode in fire. Extinguish with water, dry chemicals, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_2 = \text{CHCOOCH}_2\text{CH}_2\text{OH}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 818-61-1  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51379

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves.  
3.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Contact with liquid irritates eyes and skin.  
3.3 Treatment of Exposure: INHALATION: remove victim from exposure; support respiration; call physician if needed. EYES: wash with large amounts of water for 15 min.; call physician. SKIN: flush with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2: oral  $\text{LD}_{50} = 1,070 \text{ mg/kg}$  (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 220°F O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Water, dry chemical, alcohol foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Containers may explode  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: 2.0 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 26.2 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 9.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: In the absence of inhibitor, polymerization will occur, especially when heated.  
5.6 Inhibitor of Polymerization: Monomethyl ether of hydroquinone, 400 ppm

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: B  
7.6 Ship Type: 2  
7.7 Barge Hull Type: 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 116.1  
9.3 Boiling Point at 1 atm:  $>346^\circ\text{F} = >210^\circ\text{C} = >583^\circ\text{K}$   
9.4 Freezing Point:  $-76^\circ\text{F} = -60^\circ\text{C} = 213^\circ\text{K}$   
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.10 at 25°C (liquid)  
9.8 Liquid Surface Tension: (est.) 28 dynes/cm = 0.028 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.)  $-10,800 \text{ Btu/lb} = -6,000 \text{ cal/g} = -250 \times 10^5 \text{ J/kg}$   
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: (est.)  $-218 \text{ Btu/lb} = -121 \text{ cal/g} = -5.06 \times 10^5 \text{ J/kg}$   
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Low

### NOTES

# 2-HYDROXYETHYL ACRYLATE

HAI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	70.160	34	0.471	42	1.048	60	7.064
36	70.089	36	0.472	44	1.048	61	6.879
38	70.020	38	0.473	46	1.048	62	6.699
40	69.950	40	0.474	48	1.048	63	6.524
42	69.879	42	0.476	50	1.048	64	6.355
44	69.809	44	0.477	52	1.048	65	6.190
46	69.740	46	0.478	54	1.048	66	6.031
48	69.669	48	0.479	56	1.048	67	5.876
50	69.599	50	0.480	58	1.048	68	5.726
52	69.530	52	0.481	60	1.048	69	5.580
54	69.459	54	0.482	62	1.048	70	5.438
56	69.389	56	0.483	64	1.048	71	5.301
58	69.320	58	0.484	66	1.048	72	5.167
60	69.250	60	0.486	68	1.048	73	5.037
62	69.179	62	0.487	70	1.048	74	4.911
64	69.120	64	0.488	72	1.048	75	4.789
66	69.049	66	0.489	74	1.048	76	4.670
68	68.980	68	0.490	76	1.048	77	4.555
70	68.910	70	0.491				
72	68.839	72	0.492				
74	68.770	74	0.493				
76	68.700	76	0.494				
78	68.629	78	0.496				
80	68.559	80	0.497				
82	68.490	82	0.498				
84	68.419	84	0.499				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	177	0.090	177	0.00153		N
	I	178	0.092	178	0.00156		O
	S	179	0.094	179	0.00158		T
	C	180	0.095	180	0.00161		
	I	181	0.097	181	0.00164		P
	B	182	0.099	182	0.00166		E
	L	183	0.100	183	0.00169		R
	E	184	0.102	184	0.00172		T
		185	0.104	185	0.00174		I
		186	0.106	186	0.00177		N
		187	0.108	187	0.00180		E
		188	0.110	188	0.00183		N
		189	0.111	189	0.00186		T
		190	0.113	190	0.00189		
		191	0.115	191	0.00192		
		192	0.117	192	0.00195		
		193	0.119	193	0.00198		
		194	0.121	194	0.00201		

# N-HEXALDEHYDE

HAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Caproaldehyde Capronaldehyde Capronic aldehyde n-Caproylaldehyde Hexanal	Liquid  Colorless  Sharp unpleasant odor  Floats on water. Flammable, irritating vapor is produced.
<b>Fire</b> Combustible. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
<b>Exposure</b> VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_4\text{CHO}$   
2.3 IMO/UN Designation: 3.3/1207  
2.4 DOT ID No.: 1207  
2.5 CAS Registry No.: 66-25-1  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Ingestion causes irritation of mouth and stomach. Contact with vapor or liquid irritates eyes. Liquid irritates skin.  
3.3 **Treatment of Exposure:** INGESTION: give large amount of water and induce vomiting. EYES: flush with water for at least 15 min. SKIN: wipe off; wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 4,890 \text{ mg/kg}$  (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 90°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 5.21 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May attack some forms of plastics.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 99+%; Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 100  
9.3 **Boiling Point at 1 atm:** 262°F = 128°C = 401°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.83 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.061 at 20°  
9.12 **Latent Heat of Vaporization:** (est.) 153 Btu/lb = 85 cal/g =  $3.6 \times 10^5 \text{ J/kg}$   
9.13 **Heat of Combustion:** (est.) -17,000 Btu/lb = -9,430 cal/g =  $-394 \times 10^5 \text{ J/kg}$   
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N-HEXALDEHYDE

HAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	52.710	51	0.480	51	1.048	N O T	P E R T I N E N T
44	52.640	52	0.480	52	1.048		
46	52.570	53	0.480	53	1.048		
48	52.500	54	0.480	54	1.048		
50	52.430	55	0.480	55	1.048		
52	52.370	56	0.480	56	1.048		
54	52.300	57	0.480	57	1.048		
56	52.230	58	0.480	58	1.048		
58	52.160	59	0.480	59	1.048		
60	52.090	60	0.480	60	1.048		
62	52.020	61	0.480	61	1.048		
64	51.950	62	0.480	62	1.048		
66	51.880	63	0.480	63	1.048		
68	51.810	64	0.480	64	1.048		
70	51.740	65	0.480	65	1.048		
72	51.670	66	0.480	66	1.048		
74	51.600	67	0.480	67	1.048		
76	51.530	68	0.480	68	1.048		
		69	0.480	69	1.048		
		70	0.480	70	1.048		
		71	0.480	71	1.048		
		72	0.480	72	1.048		
		73	0.480	73	1.048		
		74	0.480	74	1.048		
		75	0.480	75	1.048		
		76	0.480	76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E			N O T		N O T	0	0.314
						20	0.323
						40	0.333
						60	0.342
						80	0.351
						100	0.360
						120	0.368
						140	0.377
						160	0.385
						180	0.393
						200	0.402
						220	0.409
						240	0.417
						260	0.425
						280	0.433
						300	0.440
						320	0.447
						340	0.454
						360	0.461
						380	0.468
						400	0.475
						420	0.481
						440	0.488
						460	0.494
						480	0.500
						500	0.506

# HYDROXYLAMINE SULFATE

HAS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Oxammonium sulfate	Solid  White  Odorless  Sinks and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear chemical protective suit with self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not Flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. If swallowed will cause nausea or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $(\text{NH}_2\text{OH})_2\text{H}_2\text{SO}_4$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2865  
2.5 CAS Registry No.: 10039-54-0  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Acid-resistant protective clothing, including coveralls, wrist-length gloves, cap, goggles, and dust mask
- 3.2 **Symptoms Following Exposure:** Inhalation of dust or ingestion may cause systemic poisoning characterized by cyanosis, methemoglobinemia, convulsions, and coma. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; get medical attention if symptoms occur. INGESTION: give large amount of water; induce vomiting; get medical attention. EYES: flush with water for at least 15 min., and get medical attention. SKIN: flush immediately with plenty of water, then wash with soap and water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3;  $\text{LD}_{50} = 50\text{-}500 \text{ mg/kg}$   
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Sulfuric acid fumes may form in fires.  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: May be corrosive to metals in presence of moisture  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Flush with water  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 97-99%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 164.14  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: >1 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES



# HYDROXYLAMINE SULFATE

HAS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	64.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 2-HYDROXY-4-(METHYLTHIO)-BUTANOIC ACID

HBA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Alimet Butyric acid, 2-hydroxy-4-methylthio- HSDB 5700 Methionine hydroxy analog MHA acid MHA-FA		Liquid  Light brown
Avoid contact with liquid and vapor. Keep people away. Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies.		
<b>Fire</b>	Combustible. Water may be ineffective on fire. Wear self-contained breathing apparatus and protective clothing. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> .	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed, may cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	May be dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 4; Organic acids.  
2.2 Formula: CH<sub>3</sub>S(CH<sub>2</sub>)<sub>2</sub>CHOHCOOH  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 583-91-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear approved respirator with full face piece, chemical resistant gloves and clothing.  
3.2 **Symptoms Following Exposure:** Corrosive to the eyes and moderately irritating to the skin.  
3.3 **Treatment of Exposure:** EYES: Flush with plenty of water for at least 15 minutes. SKIN: Remove contaminated clothing. Flush with plenty of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 3.478 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available.  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 250°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray, alcohol foam, dry chemical, carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Decomposes above 160°C = 320°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Corrosive.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate solution. Flush with water.  
5.5 **Polymerization:** Does not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 150.2  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.21-1.23  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 5.19  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** .48-.55 psia

### NOTES

# 2-HYDROXY-4-(METHYLTHIO)-BUTANOIC ACID

HBA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.259 0.267 0.276 0.284 0.292 0.300 0.308 0.316 0.323 0.331 0.338 0.345 0.352 0.359 0.365 0.372 0.378 0.384 0.390 0.396 0.402 0.407 0.413 0.418 0.424

# HYDROGEN BROMIDE

HBR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hydrobromic acid, anhydrous Hydrogen bromide, anhydrous	Gas  Colorless  Irritating odor  Sinks and mixes with water. Poisonous visible vapor cloud is produced.
Evacuate. Keep people away. <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear chemical protective suit with self-contained breathing apparatus. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Flammable gas may be produced on contact with metals. Wear chemical protective suit with self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Will cause frostbite. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** HBr  
2.3 **IMO/UN Designation:** 2/1048  
2.4 **DOT ID No.:** 1048  
2.5 **CAS Registry No.:** 10035-10-6  
2.6 **NAERG Guide No.:** 125  
2.7 **Standard Industrial Trade Classification:** 52241

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full face mask and acid gas canister; self-contained breathing apparatus; chemical goggles; rubber apron and gloves; acid-proof clothing; safety shower
- 3.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of nose and upper respiratory tract, lung injury. Ingestion causes burns of mouth and stomach. Contact with eyes causes severe irritation and burns. Contact with skin causes irritation and burns.
- 3.3 **Treatment of Exposure:** Get medical attention after all overexposures to this chemical. **INHALATION:** move victim to fresh air and keep him warm and quiet; if a qualified person is available to give oxygen, such treatment may be helpful. **INGESTION:** give large amounts of water or milk; do NOT induce vomiting. **EYES:** flush with water for at least 15 min. **SKIN:** flush with water; treat acid burns.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 3 ppm  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 30 ppm  
3.14 **OSHA PEL-TWA:** 3 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Pressurized container may explode and release toxic, irritating vapor.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Moderate reaction with evolution of heat.
- 5.2 **Reactivity with Common Materials:**  
Rapidly absorbs moisture, forming hydrobromic acid. Highly corrosive to most metals, with evolution of flammable hydrogen gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
10-100 ppm/96 hr"/TL<sub>m</sub>/\*  
\*Species and water type not specified.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: -  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.8+%
- 7.2 **Storage Temperature:** Ambient or lower
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison gas
- 8.2 **49 CFR Class:** 2.3
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 80.92
- 9.3 **Boiling Point at 1 atm:** -88.2°F = -66.8°C = 206.4°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** 193.6°F = 89.8°C = 363°K
- 9.6 **Critical Pressure:** 1,235 psia = 84 atm = 8.52 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 2.14 at -67°C (liquid)
- 9.8 **Liquid Surface Tension:** 27.1 dynes/cm = 0.0271 N/m at -67.1°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 2.71
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.38
- 9.12 **Latent Heat of Vaporization:** 92.3 Btu/lb = 51.3 cal/g = 2.15 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 445 Btu/lb = 247 cal/g = 10.3 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 7.1 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# HYDROGEN BROMIDE

HBR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-126	145.199	-102	0.176		N		N
-124	144.599	-101	0.176		O		O
-122	144.000	-100	0.176		T		T
-120	143.400	-99	0.176				
-118	142.799	-98	0.176		P		P
-116	142.199	-97	0.176		E		E
-114	141.500	-96	0.176		R		R
-112	140.900	-95	0.176		T		T
-110	140.300	-94	0.176		I		I
-108	139.699	-93	0.176		N		N
-106	139.099	-92	0.176		E		E
-104	138.500	-91	0.176		N		N
-102	137.900	-90	0.176		T		T
-100	137.199	-89	0.176				
-98	136.599						
-96	136.000						
-94	135.400						
-92	134.799						
-90	134.199						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	219.799	-90	13.990	-90	0.28520	40	0.089
36	218.500	-85	16.090	-85	0.32370	50	0.089
38	217.299	-80	18.440	-80	0.36600	60	0.089
40	216.000	-75	21.050	-75	0.41260	70	0.089
42	214.799	-70	23.960	-70	0.46350	80	0.089
44	213.500	-65	27.180	-65	0.51910	90	0.089
46	212.299	-60	30.730	-60	0.57960	100	0.089
48	211.000	-55	34.640	-55	0.64530	110	0.089
50	209.799	-50	38.940	-50	0.71640	120	0.089
52	208.599	-45	43.640	-45	0.79330	130	0.089
54	207.299	-40	48.780	-40	0.87620	140	0.089
56	206.099	-35	54.390	-35	0.96540	150	0.089
58	204.799	-30	60.480	-30	1.06100	160	0.089
60	203.599	-25	67.089	-25	1.16400	170	0.089
62	202.299	-20	74.250	-20	1.27300	180	0.089
64	201.099	-15	81.990	-15	1.39000	190	0.089
66	199.799	-10	90.339	-10	1.51400	200	0.089
68	198.599	-5	99.320	-5	1.64700	210	0.089
70	197.400	0	109.000	0	1.78700		
72	196.099	5	119.299	5	1.93600		
74	194.900	10	130.400	10	2.09300		
76	193.599						
78	192.400						
80	191.099						
82	189.900						
84	188.599						

# HEXACHLOROBUTADIENE

HCB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,3-Butadiene, 1,1,2,3,4,4-hexachloro-HCBD Hexachloro-1,3-butadiene Perchlorobutadiene	Liquid	Colorless	Mild, faint turpentine-like
	Sinks in water.		
<b>AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.</b> Wear positive pressure breathing apparatus and special protective clothing. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	May burn but does not ignite readily. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Wear positive pressure breathing apparatus and special protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Combat fire from safe distance or protected location (behind barriers) with unmanned monitor nozzle.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS; may be fatal if inhaled. May cause respiratory difficulty and irritation of eyes, skin and mucous membranes. Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS; MAY BE FATAL IF SWALLOWED OR ABSORBED THROUGH SKIN. May cause burns to skin and eyes. IF IN EYES OR ON SKIN, flush with running water for at least 15 min., hold eyelids open if necessary. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CCl<sub>2</sub>=CCl-CCl=CCl<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/2279  
2.4 DOT ID No.: 2279  
2.5 CAS Registry No.: 87-68-3  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 51138

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear positive pressure breathing apparatus and special protective clothing.
- 3.2 **Symptoms Following Exposure:** Poisonous; may be fatal if inhaled, swallowed or absorbed through the skin. Inhalation causes respiratory difficulty and irritation of mucous membranes. Skin and eye irritant; may cause burns.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Speed in removing material from skin is extremely important. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. INGESTION: If victim is unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 **TLV-TWA:** 0.02 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 90 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Can cause mutagenic, teratogenic and tumorigenic effects. It is a suspect human carcinogen, and it may cause kidney damage.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** .006 ppm
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
**Products:** They contain highly toxic and irritating chloride fumes.
- 4.6 **Behavior in Fire:** May burn to produce highly toxic and irritating gases.
- 4.7 **Auto Ignition Temperature:** 1,130°F.
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 0.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
.09 mg/l/96 hr/goldfish/TL<sub>m</sub>/freshwater
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:** It does not bioaccumulate in aquatic organisms via the food chain.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** U128/D033
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 260.76
- 9.3 **Boiling Point at 1 atm:** 410-428°F. = 210-220°C. = 283-293°K.
- 9.4 **Freezing Point:** -2.2°F. = -19°C. = 254°K.
- 9.5 **Critical Temperature:** (est.) 315-342°F. = 157-172°C. = 430-445°K.
- 9.6 **Critical Pressure:** 41 psia = 28 atm = 2.8 MN/m<sup>2</sup> (est.)
- 9.7 **Specific Gravity:** 1.675 at 15.5°C.
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 9.0 (est.)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# HEXACHLOROBUTADIENE

HCB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
59	104.600		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	100 110 120 130 140 150 160 170 180 190 200	2.446 2.326 2.207 2.087 1.968 1.848 1.729 1.609 1.490 1.370 1.251

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	225 250 275 300 325 350	0.470 0.544 0.619 0.693 0.767 0.842	225 250 275 300 325 350	0.03700 0.07300 0.10800 0.14400 0.18000 0.21600		C U R R E N T L Y  N O T  A V A I L A B L E

# HEXACHLOROCYCLOPENTADIENE

HCC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Perchlorocyclopentadiene	Liquid  Greenish yellow  Harsh, unpleasant odor  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Poisonous gases may be produced when heated.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: C<sub>6</sub>Cl<sub>6</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2646
- 2.5 CAS Registry No.: 77-47-4
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective clothing, including rubber gloves and rubber shoes or boots; self-contained breathing apparatus; face shield
- 3.2 **Symptoms Following Exposure:** Inhalation of mist is highly irritating to mucous membranes, causing lachrymation, sneezing, and salivation; pulmonary edema may occur. Ingestion causes nausea, vomiting, diarrhea, depression. Contact with eyes causes severe irritation. Liquid is extremely irritating to the skin, causing blistering and burning.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give artificial respiration and/or oxygen as needed. INGESTION: give large amounts of water and induce vomiting; give saline laxative. EYES: flush with water for at least 15 min.; if irritation remains, get medical attention. SKIN: wash with soap and water until no odor remains.
- 3.4 TLV-TWA: 0.01 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 4; oral LD<sub>50</sub> = 0.505 mg/kg (mouse), 113 mg/kg (rat)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: 0.15-0.33 ppm
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: If water is used on adjacent fires, do not allow water to enter drums or storage tanks.
- 4.5 Special Hazards of Combustion Products: Toxic hydrogen chloride, chlorine, and phosgene gases may form in fires.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts slowly to form hydrochloric acid. The reaction is not hazardous.
- 5.2 Reactivity with Common Materials: In presence of moisture, will corrode iron and other metals. Flammable and explosive hydrogen gas may collect in enclosed space.
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Rinse with dilute solution of sodium bicarbonate or soda ash.
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Highly toxic
- 6.2 Waterfowl Toxicity: Highly toxic
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: Possible accumulation of breakdown products
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 97+%; Synthesis grade
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: Not listed.I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 10 pounds
- 8.7 EPA Pollution Category: A
- 8.8 RCRA Waste Number: U130
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 272.7
- 9.3 Boiling Point at 1 atm: 462°F = 239°C = 512°K
- 9.4 Freezing Point: 50°F = 10°C = 283°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.71 at 20°C (liquid)
- 9.8 Liquid Surface Tension: 37.5 dynes/cm = 0.0375 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: 9.42
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: (est.) 76 Btu/lb = 42 cal/g = 1.8 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES



# HEXACHLOROCYCLOPENTADIENE

HCC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	107.700	N O T  P E R T I N E N T	N O T  P E R T I N E N T	N O T  P E R T I N E N T	N O T  P E R T I N E N T	70	8.933
52	107.599					72	8.579
54	107.500					74	8.240
56	107.400					76	7.918
58	107.400					78	7.610
60	107.299					80	7.317
62	107.200					82	7.037
64	107.099					84	6.769
66	107.000					86	6.514
68	106.900					88	6.270
70	106.799					90	6.036
72	106.700					92	5.813
74	106.599					94	5.600
76	106.500					96	5.396
						98	5.201
						100	5.014
						102	4.836
						104	4.664

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		220	0.180	220	0.00674	N O T  P E R T I N E N T	N O T  P E R T I N E N T
		230	0.230	230	0.00847		
		240	0.291	240	0.01057		
		250	0.366	250	0.01311		
		260	0.458	260	0.01615		
		270	0.568	270	0.01979		
		280	0.702	280	0.02410		
		290	0.862	290	0.02920		
		300	1.052	300	0.03519		
		310	1.278	310	0.04220		
		320	1.545	320	0.05036		
		330	1.859	330	0.05981		
		340	2.226	340	0.07073		
		350	2.654	350	0.08328		
		360	3.151	360	0.09765		
		370	3.725	370	0.11400		
		380	4.386	380	0.13270		
		390	5.144	390	0.15380		
		400	6.011	400	0.17760		
		410	7.000	410	0.20450		
		420	8.122	420	0.23460		
		430	9.394	430	0.26820		
		440	10.830	440	0.30580		
		450	12.440	450	0.34750		
		460	14.260	460	0.39380		

# HEXACHLOROETHANE

HCE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Avlothane Distokal Distopan Egitol Ethane hexachloride Falkitol Fasciolin Perchloroethane	Solid  Colorless to pale yellow  Camphor-like odor  Sinks in water.
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear rubber overclothing (including gloves). Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. Poisonous gases may be produced when heated.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Cl}_2\text{CCCl}_2$
- 2.3 IMO/UN Designation: NA/9037
- 2.4 DOT ID No.: 9037
- 2.5 CAS Registry No.: 62-72-1
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 51136

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles; plastic face shield; air- or oxygen-supplied mask; safety hat with brim; solvent-proof apron; synthetic rubber gloves
- 3.2 **Symptoms Following Exposure:** Compound is a powerful narcotic and liver poison; may also cause changes in blood composition and neurological disturbances. Repeated exposure by inhalation can be fatal. Ingestion causes vomiting, diarrhea, severe mucosal injury, liver necrosis, cyanosis, unconsciousness, loss of reflexes, and death. Contact with eyes causes irritation and lachrymation. Can be absorbed through the skin and may produce severe skin lesions.
- 3.3 **Treatment of Exposure:** INHALATION: Remove victim from exposure; begin artificial respiration if breathing has ceased. INGESTION: Induce vomiting; call physician. EYES: Irrigate with water for 15 min. SKIN: Remove clothing; wash skin thoroughly with warm water and soap.
- 3.4 **TLV-TWA:** 1 ppm
- 3.5 **TLV-STEL:** No data available
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral  $\text{LD}_{50} = 4.46 \text{ g/kg (rat)}$
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Liver poisoning, nervous disorders, suspected carcinogen
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 300 ppm
- 3.14 **OSHA PEL-TWA:** 1 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride vapor may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** May attack some forms of plastics
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%, 99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U131/D034
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 236.74
- 9.3 **Boiling Point at 1 atm:** Not Pertinent
- 9.4 **Freezing Point:**  $368^{\circ}\text{F} = 186^{\circ}\text{C} = 459^{\circ}\text{K}$  (sublimes)
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 2.091 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 8.16
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:**  $92.7 \text{ Btu/lb} = 51.5 \text{ cal/g} = 2.15 \times 10^5 \text{ J/kg}$
- 9.13 **Heat of Combustion:**  $-836.4 \text{ Btu/lb} = -464.6 \text{ cal/g} = -19.4 \times 10^5 \text{ J/kg}$
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.04 psia

### NOTES

# HEXACHLOROETHANE

HCE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	130.540		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
71	0.005	100 120 140 160 180 200 220 240 260 280 300 320 340 360	0.024 0.058 0.123 0.237 0.422 0.706 1.125 1.722 2.548 3.660 5.129 7.033 9.460 12.511		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.119 0.122 0.124 0.126 0.129 0.131 0.133 0.136 0.138 0.140 0.142 0.145 0.147 0.149 0.152 0.154 0.156 0.158 0.161 0.163 0.165 0.168 0.170 0.172 0.175

# HYDROCHLORIC ACID

HCL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Muriatic acid	Watery liquid  Colorless  Sharp, irritating odor  Sinks and mixes with water. Irritating vapor is produced.
Evacuate. Keep people away. <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear chemical protective suit with self-contained breathing apparatus. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Flammable gas may be produced on contact with metals. Wear chemical protective suit with self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause coughing or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. May be dangerous if it enters water intakes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 1; Non-oxidizing mineral acid
- 2.2 Formula: HCl-H<sub>2</sub>O
- 2.3 IMO/UN Designation: 8.0/1789
- 2.4 DOT ID No.: 1789
- 2.5 CAS Registry No.: 7647-01-0
- 2.6 NAERG Guide No.: 157
- 2.7 Standard Industrial Trade Classification: 52231

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing equipment, air-line mask, or industrial canister-type gas mask; rubber or rubber-coated gloves, apron, coat, overalls, shoes.
- 3.2 **Symptoms Following Exposure:** Inhalation of fumes results in coughing and choking sensation, and irritation of nose and lungs. Liquid causes burns.
- 3.3 **Treatment of Exposure:** INHALATION: remove person to fresh air; keep him warm and quiet and get medical attention immediately; start artificial respiration if breathing stops. INGESTION: have person drink water or milk; do NOT induce vomiting. EYES: immediately flush with plenty of water for at least 15 min. and get medical attention; continue flushing for another 15 min. if physician does not arrive promptly. SKIN: immediately flush skin while removing contaminated clothing; get medical attention promptly; use soap and wash area for at least 15 min.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: 5 ppm
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second- degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** 1-5 ppm
- 3.13 IDLH Value: 50 ppm
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: 5 ppm
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors are generated when heated.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Corrosive to most metals with evolution of hydrogen gas, which may form explosive mixtures with air.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
282 ppm/96 hr/mosquito fish/TL<sub>50</sub>/fresh water  
100-330 ppm/48 hr/shrimp/LC<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Food processing or technical: 18° Be-27.9%, 20 Be-31.5%, 22° Be-35.2%; Reagent, ACS, and USP: 23° Be-37.1%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 36.46
- 9.3 **Boiling Point at 1 atm:** 123°F = 50.5°C = 323.8°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.19 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** 178 Btu/lb = 98.6 cal/g = 4.13 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -860 Btu/lb = -480 cal/g = -20 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 13.0 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 8.0 psia \*Physical properties apply to 37 % solution.

### NOTES

# HYDROCHLORIC ACID

HCL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	74.770	35	0.417		N O T		N O T
50	74.599	40	0.429				
60	74.419	45	0.441				
70	74.250	50	0.453				
80	74.080	55	0.465				
90	73.900	60	0.477		P E R T I N E N T		P E R T I N E N T
100	73.730	65	0.489				
110	73.559	70	0.501				
120	73.381	75	0.513				
		80	0.525				
		85	0.537				
		90	0.548				
		95	0.560				
		100	0.572				
		105	0.584				
		110	0.596				
		115	0.608				
		120	0.620				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	52	1.844		N O T		N O T
		54	1.970				
		56	2.104				
		58	2.246				
		60	2.396				
		62	2.555		P E R T I N E N T		P E R T I N E N T
		64	2.723				
		66	2.901				
		68	3.088				
		70	3.287				
		72	3.496				
		74	3.717				
		76	3.951				
		78	4.197				
		80	4.456				
		82	4.730				
		84	5.018				
		86	5.321				
		88	5.640				
		90	5.975				
		92	6.328				
		94	6.699				
		96	7.089				
		98	7.499				
		100	7.929				
		102	8.380				

# HYDROGEN CYANIDE

HCN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hydrocyanic acid Prussic acid	Watery liquid, or gas    Colorless    Bitter almond odor  Sinks and mixes with water. Poisonous, flammable vapor is produced and rises. Boiling point is 78°F.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR. WEAR CHEMICAL PROTECTIVE SUIT WITH SELF-CONTAINED BREATHING APPARATUS.</b> Shut off ignition sources and call fire department. Evacuate area. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. WEAR CHEMICAL PROTECTIVE SUIT WITH SELF-CONTAINED BREATHING APPARATUS. Stop discharge if possible. Cool exposed containers and protect men effecting shutoff with water. Let fire burn.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration (but NOT mouth to mouth). If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: HCN 2.3 IMO/UN Designation: 2.0/1051 2.4 DOT ID No.: 1051 2.5 CAS Registry No.: 74-90-8 2.6 NAERG Guide No.: 117 2.7 Standard Industrial Trade Classification: 52381
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> CAUTION-Class A poison; asphyxiation can be caused by ingestion, inhalation, or absorption of liquid or vapor through skin (particularly eyes, mucous membranes, and feet). Escape purposes only-air escape mask with 5-minute air cylinder. Work purposes-vapor-proof emergency suit or vinyl-coated coverall, plus air mask with clear-view facepiece, speaking diaphragm, demand regulator, and 30-minute air cylinder. Rubber gloves; chemical safety goggles; quick-opening safety shower.  3.2 <b>Symptoms Following Exposure:</b> Irritation of throat, palpitation, difficult breathing, reddening of eyes, salivation, nausea, headache, weakness of arms and legs, giddiness-followed by collapse and convulsions.  3.3 <b>Treatment of Exposure:</b> Call a doctor. If breathing has stopped, give artificial respiration until doctor arrives. INHALATION: remove patient to fresh air. SKIN CONTACT: remove contaminated clothing and wash skin thoroughly with copious quantities of water and soap. EYE CONTACT: hold eyelids apart and wash eye with continuous gentle stream of water for at least 15 min. If patient is unconscious, administer amyl nitrite by crushing a pearl (ampule) in a cloth and holding this under patient's nose for 15 seconds in every minute. Do not interrupt artificial respiration. Replace amyl nitrite pearl when its strength is spent. Continue treatment until patient's condition improves or doctor arrives.  3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: 4.7 ppm 3.7 Toxicity by Ingestion: Grade 4; LD <sub>50</sub> less than 50 mg/kg 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Vapor is not very irritating but is extremely poisonous. 3.11 Liquid or Solid Characteristics: Liquid is not irritating but is extremely poisonous if absorbed through skin or eyes.  3.12 Odor Threshold: 1 mg/m <sup>3</sup> 3.13 IDLH Value: 50 ppm 3.14 OSHA PEL-TWA: 10 ppm 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEG1: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 0°F C.C.  
4.2 Flammable Limits in Air: 5.6%-40.0%  
4.3 Fire Extinguishing Agents: Stop flow of gas  
4.4 Fire Extinguishing Agents Not to Be Used: None  
4.5 Special Hazards of Combustion Products: Extremely toxic vapors are generated even at ordinary temperatures.  
4.6 Behavior in Fire: Containers may explode with ignition of contents.  
4.7 Auto Ignition Temperature: 1004°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: 1.8 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 10.7 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 2.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Dissolves with a moderate reaction.  
5.2 Reactivity with Common Materials: None  
5.3 Stability During Transport: May become unstable and subject to explosion if stored for extended time or exposed to high temp. and pressure.  
5.4 Neutralizing Agents for Acids and Caustics: The weak acidity can be neutralized by slaked lime, but this does not destroy the poisonous property.  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 0.16 ppm/72 hr/young bass/TL<sub>50</sub>/fresh water  
0.069 ppm/24 hr/pin perch/TL<sub>50</sub>/salt water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 96%; sometimes shipped as a water solution, or absorbed on an inert solid. All forms are extremely toxic.  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: May be padded  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	4
Instability (Yellow).....	2

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: P063  
8.9 EPA FWPCA List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 27.03  
9.3 Boiling Point at 1 atm: 78.3°F = 25.7°C = 298.9°K  
9.4 Freezing Point: 8.1°F = -13.3°C = 259.9°K  
9.5 Critical Temperature: 362.3°F = 183.5°C = 456.7°K  
9.6 Critical Pressure: 735 psia = 50 atm = 5.07 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.689 at 20°C (liquid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 0.9  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.303  
9.12 Latent Heat of Vaporization: 444 Btu/lb = 247 cal/g = 10.3 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -10,560 Btu/lb = -5864 cal/g = -245.3 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 74.38  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# HYDROGEN CYANIDE

HCN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
10	45.620	15	0.621		N		N
15	45.400	20	0.622		O		O
20	45.170	25	0.624		T		T
25	44.950	30	0.625				
30	44.720	35	0.626		P		P
35	44.500	40	0.627		E		E
40	44.270	45	0.628		R		R
45	44.050	50	0.629		T		T
50	43.820	55	0.630		I		I
55	43.600	60	0.631		N		N
60	43.370	65	0.632		E		E
65	43.150	70	0.633		N		N
70	42.920	75	0.634		T		T
75	42.690						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	15	3.274	15	0.01737	0	0.303
	I	20	3.742	20	0.01964	25	0.308
	S	25	4.265	25	0.02216	50	0.313
	C	30	4.847	30	0.02493	75	0.317
	I	35	5.495	35	0.02797	100	0.322
	B	40	6.214	40	0.03132	125	0.327
	L	45	7.010	45	0.03498	150	0.331
	E	50	7.890	50	0.03898	175	0.335
		55	8.859	55	0.04334	200	0.339
		60	9.925	60	0.04809	225	0.343
		65	11.100	65	0.05325	250	0.347
		70	12.380	70	0.05884	275	0.351
		75	13.780	75	0.06490	300	0.354
		80	15.310	80	0.07144	325	0.358
		85	16.980	85	0.07849	350	0.361
		90	18.790	90	0.08609	375	0.364
		95	20.760	95	0.09426	400	0.367
		100	22.900	100	0.10300	425	0.370
		105	25.210	105	0.11240	450	0.372
		110	27.710	110	0.12250	475	0.375
		115	30.400	115	0.13320	500	0.377
		120	33.310	120	0.14470	525	0.380
						550	0.382
						575	0.384
						600	0.386

# HEXACHLOROPHENE

HCP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,2-Dihydroxy-3,3,5,5,6,6-hexachlorodiphenylmethane 2,2-Methylene, bis[3,4,6-trichloropheno]		Solid, crystal, powder    White    Odorless
		Sinks in water.
<b>AVOID CONTACT WITH SOLID OR DUST. KEEP PEOPLE AWAY.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Notify local health and pollution control agencies.		
<b>Fire</b>	May burn but does not ignite readily. POISONOUS GASES, MAY BE PRODUCED IN FIRE OR WHEN HEATED. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Move container from fire area if you can do it without risk.	
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Poisonous if inhaled. Irritating to mucous membranes. Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Poisonous if swallowed. Irritating to eyes and skin. IF IN EYES OR ON SKIN, flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS, induce vomiting with warm salt water or syrup of ipecac. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	Effects of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: (C<sub>6</sub>HCl<sub>5</sub>OH)<sub>2</sub>CH<sub>2</sub>
- 2.3 IMO/UN Designation: 6.1/2875
- 2.4 DOT ID No.: 2875
- 2.5 CAS Registry No.: 70-30-4
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 51244

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation of dust is poisonous; irritating to mucous membranes. Eye and skin irritant. Poisonous if swallowed. Symptoms following ingestion include anorexia, nausea, vomiting, abdominal cramps, and diarrhea. Dehydration may be severe and may be associated with shock.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If victim is conscious, induce vomiting with warm salt water or syrup of ipecac. If victim is unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 60 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes reproductive and tumorigenic effects; indefinite carcinogen.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Contain toxic and irritating chloride fumes.
- 4.6 **Behavior in Fire:** Decomposes to produce toxic and irritating gases.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 61.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 19.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U132
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 406.91
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** 327-329°F. = 164-165°C. = 437-438°K.
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** Currently not available
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# HEXACHLOROPHENE

HCP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# HEXACHLORO BENZENE

HCZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzene, hexachloro- Pentachlorophenyl chloride Perchlorobenzene Phenyl perchloryl	Solid, needle-like crystals	White	Faint, not unpleasant
Sinks in water.			
<b>AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Move container from fire area if you can do it without risk.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Harmful if inhaled. Irritating to eyes, skin and mucous membranes. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. If in eyes or on skin, flush with running water for at least 15 min.; hold eyelids open if necessary.  SOLID Harmful if swallowed. Irritating to eyes and skin. IF IN EYES OR ON SKIN, flush with running water for at least 15 min.; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>6</sub>Cl<sub>6</sub>  
2.3 IMO/UN Designation: 6.1/2729  
2.4 DOT ID No.: 2729  
2.5 CAS Registry No.: 118-74-1  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Harmful by dust inhalation or if swallowed. Irritating to eyes, skin and mucous membranes. Prolonged periods of ingestion may cause cutaneous porphyria.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If victim is conscious, use gastric lavage to clean out stomach followed by saline catharsis. If victim is unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 **TLV-TWA:** 0.002 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 10.0 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Can cause mutagenic, reproductive and tumorigenic effects. It is an animal carcinogen and a human suspect carcinogen. Chronic ingestion has caused enlargement of the thyroid and lymph nodes, skin photosensitization and abnormal growth of body hair. May cause liver, kidney and lung damage.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Solid may cause slight irritation of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 468°F. C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, fog or foam; large fires: water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** They contain highly toxic chloride fumes.
- 4.6 **Behavior in Fire:** Produces highly toxic chloride fumes.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 0.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Currently not available (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** >0.32 ppm/336 hr/guppy/LC<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Not listed
- 7.4 **Venting:** Not pertinent
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** U127/D032
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 284.78
- 9.3 **Boiling Point at 1 atm:** 589°F. = 309°C. = 583°K.
- 9.4 **Freezing Point:** 446°F. = 230°C. = 503°K.
- 9.5 **Critical Temperature:** 1025°F. = 552°C. = 825°K.
- 9.6 **Critical Pressure:** 413 psia = 28.1 atm = 2.85 MN/m<sup>2</sup> (est.)
- 9.7 **Specific Gravity:** 2.044 at 24°C.
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 9.8
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Not pertinent

### NOTES

# HEXACHLOROBENZENE

HCZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	250 275 300 325 350 375 400 425 450 475 500	0.025 0.050 0.094 0.170 0.293 0.486 0.781 1.219 1.855 2.759 4.023	45 250 275 300 325 350 375 400 425 475 500	0.05378 0.00093 0.00181 0.00330 0.00572 0.00953 0.01532 0.02390 0.03628 0.07804 0.11110		N O T  P E R T I N E N T

# HYDROXYLAMINE

HDA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Oxammonium	Solid crystals      White colorless      Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid or liquid. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. May explode if exposed to heat or open flame. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Combat fires from safe distance or protected location.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR LIQUID Irritating to skin and eyes. If inhaled or swallowed may cause headache, dizziness, ringing in ears, labored breathing, nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. If breathing has stopped, give artificial respiration.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:**  $\text{NH}_2\text{OH}$   
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear protective clothing, cap, gloves, goggles - canister type mask recommended.
- 3.2 **Symptoms Following Exposure:** INHALATION: Moderately toxic by inhalation and oral routes with the following symptoms possible: headache, vertigo, tinnitus, dyspnea, nausea and vomiting, cyanosis, proteinuria and hematuria, jaundice, restlessness, and convulsion. Methemoglobinemia has been reported. EYES: Corrosive - highly irritating. SKIN: Irritating or corrosive to skin. INGESTION: Moderately toxic by inhalation and oral routes with the following symptoms possible; headache, vertigo, tinnitus, dyspnea, nausea and vomiting, cyanosis, proteinuria and hematuria, jaundice, restlessness, and convulsion. Methemoglobinemia has been reported.
- 3.3 **Treatment of Exposure:** Call a physician. EYES: Flush with water. SKIN: Wash with soap and water immediately. INGESTION: Remove by gastric lavage or emesis (vomiting) and catharsis.
- 3.4 **TLV-TWA:** Currently not available
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 50 to 500 mg/kg.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Potential mutagenic and teratogenic effects. Repeated exposure may enhance allergic reaction of the back of hands and forearms. Eczema following prolonged contact.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 265°F O.C. explodes
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Use extreme caution - material may explode. Use remote extinguishing equipment or unmanned fixed turret and hose nozzles - evacuate area.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Nitrogen oxides - toxic fumes - react with water or steam to produce heat and corrosive liquids - can react violently with reducing materials.
- 4.6 **Behavior in Fire:** May explode when exposed to heat or flame. Explodes at 265°F.
- 4.7 **Auto Ignition Temperature:** 265°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 5.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 2.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Forms alkaline solution - at high pH decomposes to  $\text{NH}_4\text{OH}$ ;  $\text{N}_2$  and  $\text{H}_2\text{O}$ .
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Unstable - hygroscopic. Decomposes even at room temperature, especially in presence of atmospheric moisture and carbon dioxide.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Sodium bisulfate
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
7.2 ppm/96-hour/Fathead minnow/ $\text{LC}_{50}/\text{H}_2\text{SO}_4$  salt  
1.2 ppm/96-hour/Daphnia magna/ $\text{LC}_{50}/\text{H}_2\text{SO}_4$  salt
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 0.231 lb/lb, 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 100% pure
- 7.2 **Storage Temperature:** Cool - noncombustible building
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Open occasionally to relieve decomposition products.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 3              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 33.03
- 9.3 **Boiling Point at 1 atm:** 133.7°F = 56.5°C = 329.7°K 22 mm 158°F = 70°C = 343.2°K 60 mm
- 9.4 **Freezing Point:** 91.49°F = 33.05°C = 306.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.227 at room temperature
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 1.14 (calculated)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** 880 Btu/lb = 488.9 cal/g =  $2.04 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** 207 Btu/lb = 115 cal/g =  $4.81 \times 10^5$  J/kg
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# HYDROXYLAMINE

HDA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
64	82.436		C		C		C
65	81.625		U		U		U
66	80.853		R		R		R
67	80.117		R		R		R
68	79.417		E		E		E
69	78.747		N		N		N
70	78.108		T		T		T
71	77.497		L		L		L
72	76.912		Y		Y		Y
73	76.351						
74	75.813		N		N		N
75	75.297		O		O		O
76	74.801		T		T		T
77	74.325						
			A		A		A
			V		V		V
			A		A		A
			I		I		I
			L		L		L
			A		A		A
			B		B		B
			L		L		L
			E		E		E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S	120	0.215	120	0.00115		C
	O	125	0.280	125	0.00147		U
	L	130	0.360	130	0.00188		R
	U	135	0.459	135	0.00237		R
	B	140	0.580	140	0.00297		E
	L	145	0.727	145	0.00368		N
	E	150	0.904	150	0.00454		T
		155	1.116	155	0.00555		L
		160	1.369	160	0.00675		Y
		165	1.668	165	0.00816		
		170	2.021	170	0.00981		N
		175	2.435	175	0.01173		O
		180	2.919	180	0.01396		T
		185	3.481	185	0.01652		A
		190	4.132	190	0.01947		V
		195	4.883	195	0.02285		A
		200	5.747	200	0.02671		I
		205	6.735	205	0.03110		L
		210	7.864	210	0.03608		A
		215	9.149	215	0.04172		B
		220	10.606	220	0.04807		L
		225	12.255	225	0.05521		E
		230	14.115	230	0.06321		

# HYDROGEN CHLORIDE

HDC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hydrochloric acid, anhydrous	Liquefied compressed gas  Colorless to slightly yellow  Irritating odor  Sinks and mixes with water. Poisonous visible vapor cloud is produced.
<b>Evacuate.</b> Keep people away. <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear chemical protective suit with self-contained breathing apparatus. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Flammable gas may be produced on contact with metals. Wear chemical protective suit with self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Will cause frostbite. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** HCl  
2.3 **IMO/UN Designation:** 2.0/1050  
2.4 **DOT ID No.:** 1050  
2.5 **CAS Registry No.:** 7647-01-0  
2.6 **NAERG Guide No.:** 125  
2.7 **Standard Industrial Trade Classification:** 52231

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Full face mask and acid gas canister; self-contained breathing apparatus; chemical goggles; rubber apron and gloves; acid-proof clothing; safety shower.  
3.2 **Symptoms Following Exposure:** Severely irritating to nose and upper respiratory tract; lung injury.  
3.3 **Treatment of Exposure:** INHALATION: immediately remove patient to fresh air, keep him warm and quiet, and call a physician immediately; if a qualified person is available to give oxygen, such treatment may be helpful. INGESTION: have victim drink water or milk; do NOT induce vomiting. EYES OR SKIN: immediately flush with plenty of water for at least 15 min.; for eyes get medical attention promptly; air contaminated clothing and wash before reuse.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 5 ppm  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second- degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** 1-5 ppm  
3.13 **IDLH Value:** 50 ppm  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 5 ppm  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Pressurized container may explode and release toxic, irritating vapors.  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** Moderate reaction with evolution of heat.  
5.2 **Reactivity with Common Materials:** Rapidly absorbs moisture, forming hydrochloric acid. Highly corrosive to most metals with evolution of flammable hydrogen gas.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
282 ppm/96 hr/mosquito fish/TL<sub>50</sub>/fresh water  
100-330 ppm/48 hr/shrimp/LC<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical: 97.5-99%  
7.2 **Storage Temperature:** Ambient or lower  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Poison gas  
8.2 **49 CFR Class:** 2.3  
8.3 **49 CFR Package Group:** Not pertinent.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Gas  
9.2 **Molecular Weight:** 36.46  
9.3 **Boiling Point at 1 atm:** -121°F = -85.0°C = 188.2°K  
9.4 **Freezing Point:** -175°F = -115°C = 158°K  
9.5 **Critical Temperature:** 124.5°F = 51.4°C = 324.6°K  
9.6 **Critical Pressure:** 1200 psia = 81.6 atm = 8.27 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.191 at -85°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 1.3  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.398  
9.12 **Latent Heat of Vaporization:** 185 Btu/lb = 103 cal/g = 4.31 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -884 Btu/lb = -491 cal/g = -20.6 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 13.0 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** High

### NOTES

# HYDROGEN CHLORIDE

HDC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T	-144 -142 -140 -138 -136 -134 -132 -130 -128 -126 -124 -122	0.420 0.420 0.420 0.420 0.420 0.420 0.420 0.420 0.420 0.420 0.420 0.420		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	-145 -140 -135 -130 -125 -120 -115 -110 -105 -100 -95 -90 -85 -80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25	6.605 7.878 9.346 11.030 12.950 15.140 17.610 20.410 23.540 27.050 30.970 35.330 40.150 45.480 51.350 57.800 64.860 72.580 80.990 90.139 100.099 110.799 122.400 134.900 148.299	-145 -140 -135 -130 -125 -120 -115 -110 -105 -100 -95 -90 -85 -80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25	0.07129 0.08370 0.09777 0.11360 0.13150 0.15140 0.17360 0.19820 0.22550 0.25550 0.28850 0.32460 0.36400 0.40690 0.45340 0.50380 0.55820 0.61680 0.67980 0.74730 0.81950 0.89660 0.97880 1.06600 1.15900	0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440	0.191 0.191

# HYDROQUINONE

HDQ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,4-Benzenediol p-Dihydroxybenzene Hydroquinol Pyrogentic acid Quinol	Solid  White, light tan to gray  Sinks and mixes with water.
<b>Keep people away. Avoid contact with solid and dust. Wear chemical protective suit with self-contained breathing apparatus. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Dust cloud may explode if ignited in an enclosed area. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn eyes. Irritating to eyes. If swallowed will cause headache, dizziness, nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: 1, 4-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2662
- 2.5 CAS Registry No.: 123-31-9
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51243

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles; respiratory protection if dust is present
- 3.2 **Symptoms Following Exposure:** Ingestion can cause ringing in the ears, nausea, dizziness, a sense of suffocation, increased respiration rate, vomiting, pallor, muscular twitchings, headache, dyspnea, cyanosis, delirium, and collapse; the urine is green or brownish-green. Lethal adult dose is 2 grams. Direct contamination of the eye with particles of hydroquinone can cause immediate irritation and may result in ulceration of the cornea. Contact with skin may cause dermatitis.
- 3.3 **Treatment of Exposure:** INGESTION: induce vomiting; perform gastric lavage, and follow with a saline cathartic and demulcents; get medical attention. EYES: flush immediately with plenty of water for 15 min. and get medical attention. SKIN: wash with soap and water.
- 3.4 TLV-TWA: 2 mg/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 370 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes bladder cancer in mice, discoloration of eyelids and eye changes in men
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: 50 mg/m<sup>3</sup>
- 3.14 OSHA PEL-TWA: 2 mg/m<sup>3</sup>
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** (molten) 350°F O.C.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Dust explosion is possible.
- 4.7 **Auto Ignition Temperature:** 960°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 0.287 ppm/48 hr/goldfish/TL<sub>m</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 53%, 5 days 25% (theo.), 0.5 days, as catechol
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure; Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: 100 pounds
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 110.11
- 9.3 **Boiling Point at 1 atm:** 545°F = 285°C = 558°K
- 9.4 **Freezing Point:** 338°F = 170°C = 443°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.33 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** -11,200 Btu/lb = -6,220 cal/g = -260 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 58.84 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# HYDROQUINONE

HDQ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	7.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# HYDROGEN SULFIDE

HDS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sulfuretted hydrogen Sulphuretted hydrogen	Gas  Colorless  Rotten egg odor, but odorless at poisonous concentrations  Sinks and boils in water. Poisonous, flammable, visible vapor cloud is produced.
<b>Fire</b> FLAMMABLE. Flashback along vapor trail may occur. May explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Stop flow of gas if possible. Cool exposed containers and men effecting shutoff with water. Let fire burn.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: H<sub>2</sub>S
- 2.3 IMO/UN Designation: 2.0/1053
- 2.4 DOT ID No.: 1053
- 2.5 CAS Registry No.: 7783-06-4
- 2.6 NAERG Guide No.: 117
- 2.7 Standard Industrial Trade Classification: 52242

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber-framed goggles; approved respiratory protection.
- 3.2 **Symptoms Following Exposure:** Irritation of eyes, nose and throat. If high concentrations are inhaled, hyperpnea and respiratory paralysis may occur. Very high concentrations may produce pulmonary edema.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; if breathing has stopped, give artificial respiration; administer oxygen if needed; consult physician. EYES: wash with plenty of water.
- 3.4 **TLV-TWA:** 10 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 15 ppm
- 3.7 **Toxicity by Ingestion:** Hydrogen sulfide is present as a gas at room temperature, so ingestion not likely.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 0.0047 ppm
- 3.13 **IDLH Value:** 100 ppm
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** 50 ppm, 10 minute peak once per 8 hour shift.
- 3.16 **OSHA PEL-Ceiling:** 20 ppm.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Flammable gas
- 4.2 **Flammable Limits in Air:** 4.3%-45%
- 4.3 **Fire Extinguishing Agents:** Stop flow of gas
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic gases are generated in fires.
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 500°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 2.3 mm/min. (liquid)
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 7.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 2.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 7.5%; CO<sub>2</sub> diluent: 11.5%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.38 ppm/48 hr/fathead minnows/TL<sub>50</sub>/fresh water  
sat./0.5 hr/bullia/lethal/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Purified; technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison gas
- 8.2 **49 CFR Class:** 2.3
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	4
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U135
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 34.08
- 9.3 **Boiling Point at 1 atm:** -76.7°F = -60.4°C = 212.8°K
- 9.4 **Freezing Point:** -117°F = -82.8°C = 190.4°K
- 9.5 **Critical Temperature:** 212.7°F = 100.4°C = 373.6°K
- 9.6 **Critical Pressure:** 1300 psia = 88.9 atm = 9.01 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.916 at -60°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.03 N/m at -61°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 1.2
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.322
- 9.12 **Latent Heat of Vaporization:** 234 Btu/lb = 130 cal/g = 5.44 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -6552 Btu/lb = -3640 cal/g = -152.4 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 16.8 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# HYDROGEN SULFIDE

HDS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T	-96 -94 -92 -90 -88 -86 -84 -82 -80 -78	0.430 0.430 0.430 0.430 0.430 0.430 0.430 0.430 0.430 0.430		N O T  P E R T I N E N T	-111	0.510

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	N O T  P E R T I N E N T	-80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45	13.260 15.210 17.400 19.820 22.520 25.500 28.780 32.390 36.360 40.700 45.440 50.600 56.210 62.290 68.879 76.000 83.669 91.919 100.799 110.299 120.500 131.299 143.000 155.299 168.500 182.400	-80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45	0.11090 0.12560 0.14170 0.15950 0.17890 0.20000 0.22300 0.24800 0.27510 0.30430 0.33570 0.36960 0.40590 0.44480 0.48630 0.53060 0.57780 0.62800 0.68130 0.73770 0.79730 0.86040 0.92680 0.99680 1.07000 1.14800	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.236 0.237 0.239 0.240 0.241 0.242 0.244 0.245 0.246 0.248 0.249 0.251 0.252 0.254 0.255 0.257 0.258 0.260 0.262 0.264 0.265 0.267 0.269 0.271 0.273

# HYDRAZINE

HDZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Watery liquid      Colorless      Ammonia odor  Mixes with water. Poisonous, flammable vapor is produced. Freezing point is 35°F.
Evacuate. Keep people away. <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear chemical protective suit with self-contained breathing apparatus. Shut off ignition sources. Call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear chemical protective suit with self-contained breathing apparatus. Combat fires from safe distance or protected location. Flood discharge area with water. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water. Continue cooling after fire has been extinguished.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Absorb

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:** N<sub>2</sub>H<sub>4</sub>
- 2.3 **IMO/UN Designation:** 8.0/2030
- 2.4 **DOT ID No.:** 2029
- 2.5 **CAS Registry No.:** 302-01-2
- 2.6 **NAERG Guide No.:** 132
- 2.7 **Standard Industrial Trade Classification:** 52268

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Ammonia-type gas mask; self-contained breathing apparatus; plastic-coated or rubber gloves, clothes, and apron; safety shower must be available.
- 3.2 **Symptoms Following Exposure:** Vapors cause itching, swelling, and blistering of eyelids, skin, nose and throat; symptoms may be delayed for several hours. Temporary blindness may occur. Liquid causes a caustic-like burn if not washed off at once. Ingestion or absorption through skin causes nausea, dizziness, headache. Severe exposure may cause death.
- 3.3 **Treatment of Exposure:** Call a doctor at once. **INHALATION:** remove to fresh air; observe for development of delayed symptoms. Keep quiet. **INGESTION:** do NOT induce vomiting; give egg whites or other emollient. **SKIN OR EYES:** wash with large amounts of water for at least 15 min.
- 3.4 **TLV-TWA:** 0.01 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes lung cancer in mice.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact; very injurious to the eyes.
- 3.12 **Odor Threshold:** 3-4 ppm
- 3.13 **IDLH Value:** 50 ppm
- 3.14 **OSHA PEL-TWA:** 1 ppm.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 100°F O.C.
- 4.2 **Flammable Limits in Air:** 4.7%-100%
- 4.3 **Fire Extinguishing Agents:** Water, alcohol foam, carbon dioxide, or dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic vapor is generated when heated.
- 4.6 **Behavior in Fire:** May explode if confined.
- 4.7 **Auto Ignition Temperature:** May ignite spontaneously 518°F (glass)
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 1 mm/min. (est.)
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 14.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 4.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Can catch fire when in contact with porous materials such as wood, asbestos, cloth, earth and rusty metals.
- 5.3 **Stability During Transport:** Stable at ordinary temperatures. When heated, can decompose to nitrogen and ammonia gases, but decomposition is not hazardous unless material is confined.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water Neutralize the resulting solution with calcium hypochlorite (HTH) (7 lbs per lb of hydrazine).
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 146 ppm/0.5 hr/rainbow trout/died/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 100%
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Anhydrous; 35-64% water solutions
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Padded
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	2
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** U1133
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 32.05
- 9.3 **Boiling Point at 1 atm:** 236.3°F = 113.5°C = 386.7°K
- 9.4 **Freezing Point:** 34.7°F = 1.5°C = 274.7°K
- 9.5 **Critical Temperature:** 716.0°F = 380°C = 653.2°K
- 9.6 **Critical Pressure:** 2130 psia = 145 atm = 14.7 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.008 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.191
- 9.12 **Latent Heat of Vaporization:** 538 Btu/lb = 299 cal/g = 12.5 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -8345 Btu/lb = -4636 cal/g = -194.1 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -218 Btu/lb = -121 cal/g = -5.07 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# HYDRAZINE

HDZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
45	63.590	40	0.727		N		N
50	63.440	50	0.730		O		O
55	63.290	60	0.733		T		T
60	63.140	70	0.737				
65	62.990	80	0.740		P		P
70	62.840	90	0.743		E		E
75	62.690	100	0.746		R		R
80	62.540	110	0.749		T		T
85	62.380	120	0.752		I		I
90	62.230	130	0.755		N		N
95	62.080	140	0.758		E		E
100	61.930	150	0.761		N		N
105	61.780	160	0.764		T		T
110	61.630	170	0.767				
115	61.480	180	0.770				
120	61.330	190	0.773				
125	61.180	200	0.776				
130	61.030	210	0.779				
135	60.880	220	0.782				
140	60.720	230	0.785				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	35	0.064	35	0.00038	0	0.352
	I	40	0.077	40	0.00046	25	0.365
	S	45	0.092	45	0.00055	50	0.378
	C	50	0.111	50	0.00065	75	0.391
	I	55	0.132	55	0.00077	100	0.403
	B	60	0.157	60	0.00090	125	0.415
	L	65	0.187	65	0.00106	150	0.426
	E	70	0.221	70	0.00124	175	0.437
		75	0.260	75	0.00145	200	0.447
		80	0.306	80	0.00169	225	0.458
		85	0.358	85	0.00196	250	0.467
		90	0.419	90	0.00227	275	0.476
		95	0.488	95	0.00262	300	0.485
		100	0.567	100	0.00302	325	0.494
		105	0.657	105	0.00347	350	0.502
		110	0.759	110	0.00398	375	0.509
		115	0.875	115	0.00454	400	0.517
		120	1.006	120	0.00518	425	0.523
		125	1.154	125	0.00589	450	0.530
		130	1.321	130	0.00669	475	0.536
		135	1.509	135	0.00758	500	0.541
		140	1.720	140	0.00856	525	0.546
		145	1.955	145	0.00965	550	0.551
		150	2.219	150	0.01086	575	0.555
		155	2.512	155	0.01220	600	0.559
		160	2.839	160	0.01368		

## HEPTANOIC ACID

HEP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Enanthic acid Hephtic acid n-Heptoic acid n-Heptylic acid Hexane carboxylic acid	Liquid  Colorless  Rancid Odor  Floats on water.
<b>Keep people away. Avoid contact with vapor or liquid. Wear self-contained breathing apparatus and full protective clothing. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Wear self-contained breathing apparatus and full protective clothing. Extinguish with dry chemical, CO <sub>2</sub> , foam, or water spray.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Harmful if inhaled. Extremely irritating to eyes, nose and throat. Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed or absorbed through skin. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk. DO NOT INDUCE VOMITING. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life is not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Collection Systems: Pump

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 4; Organic acids  
2.2 Formula: C<sub>7</sub>H<sub>14</sub>O<sub>2</sub>  
2.3 IMO/UN Designation: Not Listed  
2.4 DOT ID No.: Not Listed  
2.5 CAS Registry No.: 111-14-8  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51377

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, rubber gloves, safety goggles.
- 3.2 **Symptoms Following Exposure:** Harmful if swallowed, inhaled, or absorbed through skin. Extremely destructive to mucous membranes, upper respiratory tract, skin, and eyes. Inhalation may be fatal as a result of spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.
- 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Hold eyelids open and flush with water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes. Flush affected areas with plenty of running water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 7 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** >230°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, CO<sub>2</sub>, foam, or water spray
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 45.2 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No Reaction
- 5.2 **Reactivity with Common Materials:** No Reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Caustic soda or lime.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 96 %
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not Pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 130.19
- 9.3 **Boiling Point at 1 atm:** 433°F = 223°C = 496°K
- 9.4 **Freezing Point:** 18°F = -7.5°C = 266°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.9200 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 4.49
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** 302.8 Btu/lb = 168.2 cal/g = 7.04 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -13,634 Btu/lb = -7,574 cal/g = -317 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Low

## NOTES

# HEPTANOIC ACID

HEP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	57.430		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
59	0.250	180 200 220 240 260 280 300 320 340 360 380 400 420	0.028 0.060 0.119 0.224 0.400 0.684 1.128 1.801 2.795 4.230 6.260 9.079 12.931		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.315 0.325 0.336 0.346 0.356 0.366 0.376 0.386 0.396 0.407 0.417 0.427 0.437 0.447 0.457 0.467 0.478 0.488 0.498 0.508 0.518 0.528 0.539 0.549 0.559

# HYDROFLUORIC ACID

HFA

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Watery liquid      Colorless to green      Irritating odor

Sinks and mixes with water. Harmful vapor is produced.

Evacuate.  
Keep people away. **AVOID CONTACT WITH LIQUID AND VAPOR.**  
Wear chemical protective suit with self-contained breathing apparatus.  
Stay upwind and use water spray to "knock down" vapor.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
Flammable gas may be produced on contact with metals.  
Wear chemical protective suit with self-contained breathing apparatus.

### Exposure

CALL FOR MEDICAL AID.

VAPOR  
Will burn eyes, nose and throat.  
Harmful if inhaled.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.  
IF IN EYES, hold eyelids open and flush with plenty of water.

LIQUID  
Will burn skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
**DO NOT INDUCE VOMITING.**

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 1; Non-oxidizing mineral acid
- 2.2 Formula: HF-H<sub>2</sub>O
- 2.3 IMO/UN Designation: 8.0/1790
- 2.4 DOT ID No.: 1790
- 2.5 CAS Registry No.: 7664-39-3
- 2.6 NAERG Guide No.: 157
- 2.7 Standard Industrial Trade Classification: 52236

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Proper protective clothing must be worn that encapsulates the body including the face. All persons handling this product must be familiar with and must observe all the precautions contained in the Manufacturing Chemists' Association Chemical Safety Data Sheet SD-25. A shower and an eye wash must be available.
- 3.2 **Symptoms Following Exposure:** Serious and painful burns of eyes and skin.
- 3.3 **Treatment of Exposure:** INGESTION: have victim drink water or milk; do NOT induce vomiting. SKIN: if victim has come in contact with liquid or vapor, put him in a shower and call a physician. EYES: flush with water for at least 15 min. and consult physician.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 3 ppm as F
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third-degree burns on short contact; very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 30 ppm as F
- 3.14 **OSHA PEL-TWA:** 3 ppm as F
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors are generated when heated.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Will attack glass, concrete and certain metals containing silica, such as cast iron. Will attack natural rubber, leather, and many organic materials. May generate flammable hydrogen in contact with some metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
60 ppm"/fish/lethal/fresh water  
\*Time period not specified
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: (2)  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent: 48-51%; technical: 52-55%; 70% grade
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U134
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** 152°F = 67°C = 340°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.258 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** 649 Btu/lb = 361 cal/g = 15.1 X 10<sup>3</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -66.6 Btu/lb = -37.0 cal/g = -1.55 X 10<sup>3</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 54.7 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Varies \*Physical properties apply to 70% of solution.

## NOTES



# HYDROFLUORIC ACID

HFA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
15	80.429	34	0.702		N	32	0.850
20	80.280	36	0.704		O		
25	80.120	38	0.707		T		
30	79.959	40	0.709				
35	79.809	42	0.711		P		
40	79.650	44	0.713		E		
45	79.490	46	0.715		R		
50	79.339	48	0.718		T		
55	79.179	50	0.720		I		
60	79.030	52	0.722		N		
65	78.870	54	0.724		E		
70	78.709	56	0.727		N		
75	78.559	58	0.729		T		
80	78.400	60	0.731				
85	78.250	62	0.733				
		64	0.735				
		66	0.738				
		68	0.740				
		70	0.742				
		72	0.744				
		74	0.747				
		76	0.749				
		78	0.751				
		80	0.753				
		82	0.755				
		84	0.758				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		C U R R E N T L Y		C U R R E N T L Y		N O T
			N O T		N O T		P E R T I N E N T
			A V A I L A B L E		A V A I L A B L E		

# HYDROFLUOROSILICIC ACID (25% OR LESS)

HFS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Fluorosilicic acid HFSA	Liquid	Colorless to straw yellow	None to slight acid
<b>Wear full impervious protective clothing and approved respirator. Neutralize spilled material with lime, then flush with water. Notify local health and pollution control agencies. Protect water intakes.</b>			
<b>Fire</b>	Not flammable. Cool exposed containers with water to avoid overheating. Avoid direct contact of water with acid to reduce splattering and overheating.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush skin with water. IF IN EYES, hold eyelids open and flush with plenty of water. If swallowed and victim is conscious, give large quantity of water followed by milk of magnesia or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 1; Non-oxidizing  
Mineral Acids  
**2.2 Formula:** H<sub>2</sub>SiF<sub>6</sub>  
**2.3 IMO/UN Designation:** Currently not  
available  
**2.4 DOT ID No.:** 1778  
**2.5 CAS Registry No.:** 16961-83-4  
**2.6 NAERG Guide No.:** 154  
**2.7 Standard Industrial Trade Classification:**  
52236

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Wear full impervious protective clothing and approved respirator.  
Where splashing is possible wear full face shield or chemical safety goggles. Use approved  
respirator to protect against vapors.
- 3.2 Symptoms Following Exposure:** Acute contact will cause severe eye and skin burns. Acute vapor  
exposure may cause eye and skin irritation. Chronic exposure may cause osteofluorosis and  
respiratory impairment.
- 3.3 Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing is  
difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN:  
Remove contaminated clothing and shoes. Flush with water. INGESTION: Dilute with milk, lime  
water, or aluminum hydroxide.
- 3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 3; oral guinea pig LD<sub>50</sub> = 200 mg/kg  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Kidneys, liver, and lungs may be affected by exposures. Osteofluorosis is softening  
of the bones.  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not  
usually tolerate moderate or high concentrations.  
**3.11 Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree  
burns after a few minutes' contact.  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:**  
Not flammable.  
**4.2 Flammable Limits in Air:** Not pertinent.  
**4.3 Fire Extinguishing Agents:** Use dry  
chemical, carbon dioxide or water spray  
on adjacent fires.  
**4.4 Fire Extinguishing Agents Not to Be  
Used:** Avoid direct contact between  
water and acid.  
**4.5 Special Hazards of Combustion  
Products:** Not pertinent.  
**4.6 Behavior in Fire:** Not pertinent.  
**4.7 Auto Ignition Temperature:** Not  
pertinent.  
**4.8 Electrical Hazards:** Not pertinent.  
**4.9 Burning Rate:** Not pertinent.  
**4.10 Adiabatic Flame Temperature:** Not  
pertinent.  
**4.11 Stoichiometric Air to Fuel Ratio:** Not  
pertinent  
**4.12 Flame Temperature:** Not pertinent.  
**4.13 Combustion Molar Ratio (Reactant to  
Product):** Not pertinent  
**4.14 Minimum Oxygen Concentration for  
Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** Reacts with  
generation of heat.  
**5.2 Reactivity with Common Materials:** Can  
react with strong acids to release  
hydrogen fluoride fumes. Will react with  
metals to release hydrogen gas. Will  
attack glass and materials containing  
silica.  
**5.3 Stability During Transport:** Stable.  
**5.4 Neutralizing Agents for Acids and  
Caustics:** Lime.  
**5.5 Polymerization:** Will not polymerize.  
**5.6 Inhibitor of Polymerization:** Not  
pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
Currently not available  
**6.2 Waterfowl Toxicity:** Currently not  
available  
**6.3 Biological Oxygen Demand (BOD):**  
Currently not available  
**6.4 Food Chain Concentration Potential:**  
Currently not available  
**6.5 GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Varying concentrations  
available.  
**7.2 Storage Temperature:** Ambient.  
**7.3 Inert Atmosphere:** No requirement.  
**7.4 Venting:** Pressure vacuum valve.  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Corrosive Material  
**8.2 49 CFR Class:** 8  
**8.3 49 CFR Package Group:** II  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 144.08  
**9.3 Boiling Point at 1 atm:** Decomposes.  
**9.4 Freezing Point:** Currently not available  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 1.25  
**9.8 Liquid Surface Tension:** Currently not  
available  
**9.9 Liquid Water Interfacial Tension:** Currently  
not available  
**9.10 Vapor (Gas) Specific Gravity:** Currently not  
available  
**9.11 Ratio of Specific Heats of Vapor (Gas):**  
Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not  
available  
**9.13 Heat of Combustion:** Not pertinent.  
**9.14 Heat of Decomposition:** Currently not  
available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Not pertinent.  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not  
available

### NOTES

# HYDROFLUOROSILICIC ACID (25% OR LESS)

HFS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	10.300		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	77	0.464	77	0.01161		C U R R E N T L Y  N O T  A V A I L A B L E

# HYDROGEN FLUORIDE

HFX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hydrofluoric acid, anhydrous	Liquid or Gas	Colorless	Sharp, irritating odor
Sinks and mixes with water. Poisonous vapor is produced and slowly rises. Boiling point is 67°F.			
<b>Evacuate.</b> Keep people away. <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear chemical protective suit including self-contained breathing apparatus. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. Flammable gas may be produced on contact with metals. Wear chemical protective suit including self-contained breathing apparatus.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: HF  
2.3 IMO/UN Designation: 2.0/1052  
2.4 DOT ID No.: 1052  
2.5 CAS Registry No.: 7664-39-3  
2.6 NAERG Guide No.: 125  
2.7 Standard Industrial Trade Classification: 52241

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Acid-resistant hat, safety goggles, face shield, jacket, overalls, gauntlet-type gloves, and boots. The goggles and face shield must have plastic lenses. There must be a shower and an eye wash. Observe all precautions contained in the Manufacturing Chemists' Association Chemical Safety Data Sheet SD-25.
- 3.2 **Symptoms Following Exposure:** Serious and painful burns of eyes, skin and respiratory tract; pulmonary edema.
- 3.3 **Treatment of Exposure:** INGESTION: have victim drink water or milk; do NOT induce vomiting. SKIN: flush with water; consult physician. EYES: flush with water for at least 15 min.; consult physician.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 3 ppm as F
- 3.7 **Toxicity by Ingestion:** Oral LD<sub>50</sub> = 80 mg/kg (guinea pig)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact; very injurious to the eyes.
- 3.12 **Odor Threshold:** 0.03 mg/m<sup>3</sup>
- 3.13 **IDLH Value:** 30 ppm as F
- 3.14 **OSHA PEL-TWA:** 3 ppm as F
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors are generated when heated.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves with liberation of heat.
- 5.2 **Reactivity with Common Materials:** Will attack glass, concrete and certain metals, especially those containing silica, such as cast iron. Will attack natural rubber, leather, and many organic materials. May generate flammable hydrogen gas in contact with some metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
60 ppm"/fish/lethal/fresh water  
\*Time period not specified
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: (2)  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99-99.97%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U134
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 20.01
- 9.3 **Boiling Point at 1 atm:** 67.1°F = 19.5°C = 292.7°K
- 9.4 **Freezing Point:** -134°F = -92.2°C = 181.0°K
- 9.5 **Critical Temperature:** 447.1°F = 230.6°C = 503.8°K
- 9.6 **Critical Pressure:** 1100 psia = 74.8 atm = 7.58 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.992 at 19°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 0.7
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.399
- 9.12 **Latent Heat of Vaporization:** 145 Btu/lb = 80.5 cal/g = 3.37 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -1322 Btu/lb = -734.6 cal/g = -30.76 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 54.7 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** High

### NOTES

# HYDROGEN FLUORIDE

HFX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	65.219	18	0.836		N		N
5	64.980	20	0.836		O		O
10	64.740	22	0.836		T		T
15	64.500	24	0.836				
20	64.250	26	0.836		P		P
25	64.009	28	0.836		E		E
30	63.770	30	0.836		R		R
35	63.530	32	0.836		T		T
40	63.280	34	0.836		I		I
45	63.040	36	0.836		N		N
50	62.800	38	0.836		E		E
55	62.550	40	0.836		N		N
60	62.310	42	0.836		T		T
65	62.070	44	0.836				
		46	0.836				
		48	0.836				
		50	0.836				
		52	0.836				
		54	0.836				
		56	0.836				
		58	0.836				
		60	0.836				
		62	0.836				
		64	0.836				
		66	0.836				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	-75	0.331	-75	0.00160	0	0.348
	I	-70	0.397	-70	0.00190	25	0.348
	S	-65	0.474	-65	0.00224	50	0.348
	C	-60	0.563	-60	0.00263	75	0.348
	I	-55	0.667	-55	0.00307	100	0.348
	B	-50	0.786	-50	0.00358	125	0.348
	L	-45	0.923	-45	0.00415	150	0.348
	E	-40	1.079	-40	0.00479	175	0.348
		-35	1.258	-35	0.00552	200	0.348
		-30	1.461	-30	0.00634	225	0.348
		-25	1.690	-25	0.00725	250	0.348
		-20	1.950	-20	0.00827	275	0.348
		-15	2.242	-15	0.00940	300	0.348
		-10	2.569	-10	0.01065	325	0.348
		-5	2.936	-5	0.01204	350	0.348
		0	3.346	0	0.01357	375	0.348
		5	3.801	5	0.01525	400	0.348
		10	4.308	10	0.01710	425	0.348
		15	4.868	15	0.01912	450	0.348
		20	5.488	20	0.02133	475	0.348
		25	6.171	25	0.02374	500	0.348
		30	6.923	30	0.02635	525	0.348
						550	0.348
						575	0.348
						600	0.348

# HEXAMETHYLENEDIAMINE

HMD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,6-Diaminohexane 1,6-Hexanediamine HMDA	Solid  Colorless  Weak ammonia odor  Floats and mixes with water.
Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, foam, dry chemical, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $\text{NH}_2(\text{CH}_2)_6\text{NH}_2$ 2.3 IMO/UN Designation: 8.0/1783 2.4 DOT ID No.: 2280 2.5 CAS Registry No.: 124-09-4 2.6 NAERG Guide No.: 153 2.7 Standard Industrial Trade Classification: 51452
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Protective clothing; eye protection. 3.2 <b>Symptoms Following Exposure:</b> Vapors cause irritation of eyes and respiratory tract. Liquid irritates eyes and skin, may cause dermatitis. 3.3 <b>Treatment of Exposure:</b> SKIN OR EYES: flush immediately with water for 15 min.; call a physician. 3.4 TLV-TWA: 0.5 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Currently not available 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Repeated exposure can cause anemia and damage kidney and liver. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 3.11 <b>Liquid or Solid Characteristics:</b> Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure. 3.12 <b>Odor Threshold:</b> 0.0041 mg/m <sup>3</sup> 3.13 <b>IDLH Value:</b> Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 160°F O.C.  
4.2 **Flammable Limits in Air:** 0.7%-6.3%  
4.3 **Fire Extinguishing Agents:** Currently not available  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Anhydrous: 99.8%; 70% solution  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Nitrogen  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid (anhydrous)  
9.2 **Molecular Weight:** 116.21  
9.3 **Boiling Point at 1 atm:** 478°K = 205°C = 401°F  
9.4 **Freezing Point:** (anhyd.) 104.9°F = 40.5°C = 313.7°K (70% soln.) 28°F = -2°C = 269°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (anhyd.) 0.799 at 60°C (liquid) (70% soln.) 0.933 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (anhyd.) 34.6 dynes/cm = 0.0346 N/m at 60°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 203 Btu/lb = 113 cal/g = 4.73 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -12,200 Btu/lb = -6,790 cal/g = -284 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# HEXAMETHYLENEDIAMINE

HMD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400	0.367 0.468 0.594 0.748 0.936 1.164 1.438 1.768 2.161 2.627 3.178 3.825 4.583 5.466 6.491 7.677 9.041 10.610 12.400 14.440	210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390 400	0.00593 0.00746 0.00932 0.01157 0.01428 0.01751 0.02134 0.02587 0.03120 0.03744 0.04470 0.05311 0.06283 0.07400 0.08679 0.10140 0.11800 0.13680 0.15800 0.18180		N O T  P E R T I N E N T

# HEXAMETHYLENIMINE

HMI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Azacycloheptane Hexahydroazepine Homopiperidine	Liquid  Colorless to light yellow Ammonia-like odor  Floats and mixes slowly with water. Irritating vapor is produced.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing, difficult breathing, or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 7; Aliphatic amine  
 2.2 **Formula:** CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>NH  
 2.3 **IMO/UN Designation:** Not listed  
 2.4 **DOT ID No.:** 2493  
 2.5 **CAS Registry No.:** 111-49-9  
 2.6 **NAERG Guide No.:** 132  
 2.7 **Standard Industrial Trade Classification:** 51577

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; impervious gloves; chemical safety goggles; impervious apron and boots  
 3.2 **Symptoms Following Exposure:** Inhalation of vapor irritates respiratory tract; high concentrations may cause disturbance of the central nervous system. Ingestion causes burns of mouth and stomach. Contact with concentrated vapor may cause severe eye injury. Contact with liquid causes burns of eyes and skin.  
 3.3 **Treatment of Exposure:** INHALATION: remove victim to uncontaminated atmosphere; get medical attention. INGESTION: give large amount of water; do NOT induce vomiting; get medical attention if large amount was swallowed. EYES: flush with water for 15 min. and get medical attention. SKIN: flush with water; wash with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 4; oral LD<sub>50</sub> = 32 mg/kg (rat)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 99°F O.C.  
 4.2 **Flammable Limits in Air:** 1.6%-2.3%  
 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.  
 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back.  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 48.8 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 13.5 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** Currently not available  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 2  
 Human Oral hazard: 3  
 Human Contact hazard: II  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; Pure  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** C  
 7.6 **Ship Type:** 2  
 7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 99  
 9.3 **Boiling Point at 1 atm:** 270°F = 132°C = 405°K  
 9.4 **Freezing Point:** Not pertinent  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.880 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** Currently not available  
 9.9 **Liquid Water Interfacial Tension:** Not pertinent  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** Currently not available  
 9.13 **Heat of Combustion:** Currently not available  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Currently not available  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 4.2 psia

### NOTES



# HEXAMETHYLENIMINE

HMI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	55.830		N O T		N O T		N O T
44	55.760						
46	55.690						
48	55.630						
50	55.560		P		P		P
52	55.490		E		E		E
54	55.420		R		R		R
56	55.350		T		T		T
58	55.280		I		I		I
60	55.210		N		N		N
62	55.140		E		E		E
64	55.070		N		N		N
66	55.000		T		T		T
68	54.930						
70	54.860						
72	54.790						
74	54.720						
76	54.650						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	5.000	60	0.089	60	0.00157		N
		70	0.124	70	0.00216		O
		80	0.171	80	0.00292		T
		90	0.234	90	0.00392		
		100	0.316	100	0.00520		P
		110	0.422	110	0.00683		E
		120	0.558	120	0.00888		R
		130	0.731	130	0.01144		T
		140	0.950	140	0.01460		I
		150	1.223	150	0.01850		N
		160	1.562	160	0.02324		E
		170	1.979	170	0.02899		N
		180	2.489	180	0.03589		T
		190	3.109	190	0.04414		
		200	3.858	200	0.05393		
		210	4.756	210	0.06549		
		220	5.826	220	0.07906		
		230	7.096	230	0.09489		
		240	8.594	240	0.11330		
		250	10.350	250	0.13450		
		260	12.400	260	0.15900		

# HEXAMETHYLENETETRAMINE

HMT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aminoform Ammonioformaldehyde Hexa Hexamine Metheneamine Urotropin	Solid crystals or powder  Sinks and mixes with water.	White  Mild ammonia odor
Avoid contact with solid and vapor. Call fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. Extinguish with water, foam, dry chemical, or carbon dioxide. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_6H_{12}N_4$   
2.3 IMO/UN Designation: 4.1/1328  
2.4 DOT ID No.: 1328  
2.5 CAS Registry No.: 100-97-0  
2.6 NAERG Guide No.: 133  
2.7 Standard Industrial Trade Classification: 51452

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Gloves; for dusty or spatter conditions, use dust filter respirator and goggles.  
3.2 **Symptoms Following Exposure:** Prolonged and repeated contact may cause skin irritation.  
3.3 **Treatment of Exposure:** Wash skin or eyes thoroughly with water. Call a physician.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5$  to  $5$  g/kg (human)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 482°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Formaldehyde gas and ammonia may be given off when hot.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** >700  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 61.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical; USP  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable solid  
8.2 **49 CFR Class:** 4.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 140.19  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.35 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:**  $-13,300$  Btu/lb =  $-7400$  cal/g =  $-310 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# HEXAMETHYLENETETRAMINE

HMT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	81.259		N		N		N
36	81.530		O		O		O
38	81.799		T		T		T
40	82.059						
42	82.330		P		P		P
44	82.599		E		E		E
46	82.860		R		R		R
48	83.129		T		T		T
50	83.400		I		I		I
52	83.660		N		N		N
54	83.929		E		E		E
56	84.200		N		N		N
58	84.459		E		E		E
60	84.730		N		N		N
62	85.000		T		T		T
64	85.259						
66	85.530						
68	85.799						
70	86.059						
72	86.330						
74	86.599						
76	86.860						
78	87.129						
80	87.400						
82	87.660						
84	87.929						

# HYDROXYPROPYL ACRYLATE

HPA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Propanediol-1-acrylate Propylene glycol monoacrylate	Liquid  Colorless  Faint unpleasant odor  May float or sink in water.
Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. CONTAINERS MAY EXPLODE IN FIRE. Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water. COMBAT FIRES FROM SAFE DISTANCE OR PROTECTED LOCATION.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{CHOHCH}_2\text{COOCH}=\text{CH}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51379

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, apron, and boots; self-contained breathing apparatus.  
3.2 **Symptoms Following Exposure:** Inhalation irritates nose and throat and causes coughing; lung injury may occur. Ingestion causes irritation and burning of mouth and stomach. Vapor irritates eyes. Contact with liquid causes severe burns of eyes and burns of skin.  
3.3 **Treatment of Exposure:** INHALATION: if ill effects occur, get patient to fresh air, keep him quiet and warm, and get medical attention; if breathing stops, start artificial respiration. INGESTION: force milk or water immediately; induce vomiting only at physician's recommendation. EYES: promptly flush with plenty of water and get medical attention. SKIN: promptly flush with plenty of water; get medical attention if burning occurs.  
3.4 TLV-TWA: 0.5 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 1,230 \text{ mg/kg}$  (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 212°F O.C.  
4.2 **Flammable Limits in Air:** 1.8% (LFL)  
4.3 **Fire Extinguishing Agents:** Dry chemical, "alcohol" foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** May occur; avoid exposure to high temperatures, ultraviolet light, free-radical initiators.  
5.6 **Inhibitor of Polymerization:** 200 ppm hydroquinone

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 97%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 130  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.06 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** (est.) -12,300 Btu/lb -6,850 cal/g = -287 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# HYDROXYPROPYL ACRYLATE

HPA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	66.169		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# HEPTYL ACETATE

HPE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetate C-7 Acetic acid, heptyl ester Heptan-1-yl acetate 1-Heptyl acetate n-Heptyl acetate	Liquid  Colorless
<b>Keep people away.</b> <b>Shut off ignition sources. Call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Water may be ineffective on fire. Wear self-contained breathing apparatus and protective clothing. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse what has dissolved  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

**2.1 CG Compatibility Group:** 34; Esters  
**2.2 Formula:** CH<sub>3</sub>(CH<sub>2</sub>)<sub>6</sub>OOCC<sub>2</sub>H<sub>5</sub>  
**2.3 IMO/UN Designation:** Currently not available  
**2.4 DOT ID No.:** Not listed  
**2.5 CAS Registry No.:** 112-06-1  
**2.6 NAERG Guide No.:** Not listed  
**2.7 Standard Industrial Trade Classification:** 51372

### 3. HEALTH HAZARDS

**3.1 Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots and rubber gloves.  
**3.2 Symptoms Following Exposure:** May be harmful by inhalation, ingestion or skin absorption. Irritating to eyes, skin, and mucous membrane.  
**3.3 Treatment of Exposure:** INHALATION: Call a physician. Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with copious amounts of water for at least 15 minutes. SKIN: Wash skin with soap and water.  
**3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Currently not available  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation, such that personnel will find high concentrations unpleasant. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
**3.12 Odor Threshold:** Currently not available.  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

**4.1 Flash Point:** 154°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Alcohol foam, carbon dioxide, dry chemical, or water spray.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
**4.5 Special Hazards of Combustion Products:** When heated to decomposition, it emits acrid smoke and fumes.  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Not pertinent.  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 59.5 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

**5.1 Reactivity with Water:** No reaction.  
**5.2 Reactivity with Common Materials:** No reaction.  
**5.3 Stability During Transport:** Stable.  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent.  
**5.5 Polymerization:** Not pertinent.  
**5.6 Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

**6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (3)  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

**7.1 Grades of Purity:** 98+%  
**7.2 Storage Temperature:** Currently not available  
**7.3 Inert Atmosphere:** Not required.  
**7.4 Venting:** Not required.  
**7.5 IMO Pollution Category:** (B)  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

**8.1 49 CFR Category:** Not listed.  
**8.2 49 CFR Class:** Not pertinent.  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

**9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 158.27  
**9.3 Boiling Point at 1 atm:** 378.5°F = 192.5°C = 465.7°K  
**9.4 Freezing Point:** -58.4°F = -50.2°C = 223°K  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 0.875  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** 5.5  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# HEPTYL ACETATE

HPE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	163	0.232		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.300 0.313 0.325 0.337 0.349 0.360 0.372 0.383 0.394 0.405 0.415 0.426 0.436 0.447 0.457 0.466 0.476 0.486 0.495 0.504 0.513 0.522 0.530 0.539 0.547

# HYDROXYPROPYL METHACRYLATE

HPM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Propanediol 1-methacrylate Propylene glycol monomethacrylate	Liquid	White	Slight unpleasant odor
May float or sink in water.			
Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. CONTAINERS MAY EXPLODE IN FIRE. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water. COMBAT FIRES FROM SAFE DISTANCE OR PROTECTED LOCATION.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn eyes, Irritating to eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CH}_2\text{CHOHCH}_2\text{OCOC}(\text{CH}_3) = \text{CH}_2$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51373

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Inhalation causes coughing and irritation of nose and throat; lung injury may occur. Ingestion causes irritation and burning of mouth and stomach. Contact of vapor with eyes causes irritation. Liquid may cause severe eye burns and irritation of skin.
- 3.3 Treatment of Exposure: INHALATION: remove victim to fresh air; if required, start artificial respiration and call a doctor. INGESTION: force milk or water at once; get medical attention. EYES: flush with water for at least 15 min.; get medical attention if irritation persists. SKIN: flush with water; get medical attention for burns.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 1;  $\text{LD}_{50} = 5\text{-}500 \text{ g/kg}$  (mouse)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 250°F O.C.
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Compound may polymerize when hot and burst container.
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 40.5 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 13.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: May polymerize when hot or when exposed to ultraviolet light and free-radical catalysts.
- 5.6 Inhibitor of Polymerization: 200 ppm hydroquinone

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 95+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 144
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.06 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Currently not available
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES



# HYDROXYPROPYL METHACRYLATE

HPM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	66.169		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# HYDROGEN PEROXIDE

HPO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Albone Peroxide Superoxol	Watery liquid  Colorless  Slightly sharp odor  Sinks and mixes with water. Irritating vapor is produced.
Evacuate. Keep people away. <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear chemical protective suit including self-contained breathing apparatus. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. May cause fire and explode on contact with combustibles and metals. Containers may explode when heated. Wear chemical protective suit including self-contained breathing apparatus. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{H}_2\text{O}_2$ ;  $\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: 5.1/2015
- 2.4 DOT ID No.: 2015
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 143
- 2.7 Standard Industrial Trade Classification: 52491

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective garments, both outer and inner, made of a woven polyester fabric or of modacrylic or polyvinylidene fabrics; impermeable apron made of polyvinyl chloride or polyethylene film; neoprene gloves and boots; goggles.
- 3.2 **Symptoms Following Exposure:** Although solutions and vapors are nontoxic, they are irritating. Vapor causes discomfort of eyes and nose. Moderately concentrated liquid causes whitening of the skin and severe stinging sensation. In most cases the stinging subsides quickly and the skin gradually returns to normal without any damage. Highly concentrated liquid can cause blistering of skin if left on for any length of time; can also cause eye damage.
- 3.3 **Treatment of Exposure:** Contact should be avoided, but immediate flushing with water will prevent any reaction in case of accidental contact.
- 3.4 TLV-TWA: 1 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation, such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: 75 ppm
- 3.14 OSHA PEL-TWA: 1 ppm
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable but may cause fire and react violently on contact with combustibles and metals.
- 4.2 **Flammable Limits in Air:** Not flammable.
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** May explode in fire
- 4.7 **Auto Ignition Temperature:** Not flammable.
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Dirt and many metals cause a rapid decomposition with liberation of oxygen gas; occurs particularly if concentration is above 40%.
- 5.3 **Stability During Transport:** Pure grades are quite stable, but contamination with metals or dirt can cause rapid or violent decomposition.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
> 40 ppm/\*fingering trout/toxic/salt water  
\*Time period not specified
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Common commercial strengths are 27.5%, 35%, 50%, 70%, 90% and 98%. "High Strength" means greater than 52%. Purity: Technical; Mil. Spec.; ACS. The hazard increases with the strength.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief or pressure-vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 2 or 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer
- 8.2 49 CFR Class: 5.1
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	3
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 34.01
- 9.3 **Boiling Point at 1 atm:** 257°F = 125°C = 398°K
- 9.4 **Freezing Point:** -40.5°F = 40.3°C = 232.9°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.29 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.241
- 9.12 **Latent Heat of Vaporization:** 542 Btu/lb = 301 cal/g = 12.6 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** -1220 Btu/lb = -676 cal/g = -28.3 X 10<sup>5</sup> J/kg
- 9.15 **Heat of Solution:** -20.2 Btu/lb = -11.2 cal/g = -0.469 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 8.58 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Varies \*Physical properties apply to 70% of solution.

### NOTES

# HYDROGEN PEROXIDE

HPO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	82.330	52	0.760		N		N
36	82.259	54	0.760		O		O
38	82.190	56	0.760		T		T
40	82.120	58	0.760				
42	82.049	60	0.760		P		P
44	81.980	62	0.760		E		E
46	81.910	64	0.760		R		R
48	81.839	66	0.760		T		T
50	81.770	68	0.760		I		I
52	81.700	70	0.760		N		N
54	81.629	72	0.760		E		E
56	81.570	74	0.760		N		N
58	81.500	76	0.760		T		T
60	81.429	78	0.760				
62	81.360	80	0.760				
64	81.290	82	0.760				
66	81.219	84	0.760				
68	81.150	86	0.760				
70	81.080						
72	81.009						
74	80.940						
76	80.870						
78	80.799						
80	80.730						
82	80.660						
84	80.589						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	40	0.033	40	0.00021	0	0.285
	I	50	0.048	50	0.00030	25	0.291
	S	60	0.071	60	0.00043	50	0.297
	C	70	0.101	70	0.00060	75	0.302
	I	80	0.143	80	0.00084	100	0.308
	B	90	0.200	90	0.00115	125	0.314
	L	100	0.276	100	0.00156	150	0.319
	E	110	0.377	110	0.00209	175	0.324
		120	0.509	120	0.00278	200	0.329
		130	0.680	130	0.00365	225	0.334
		140	0.900	140	0.00475	250	0.339
		150	1.181	150	0.00613	275	0.343
		160	1.535	160	0.00785	300	0.347
		170	1.979	170	0.00996	325	0.352
		180	2.532	180	0.01254	350	0.356
		190	3.215	190	0.01568	375	0.360
						400	0.363
						425	0.367
						450	0.371
						475	0.374
						500	0.377
						525	0.380
						550	0.383
						575	0.386
						600	0.388

# HEPTANE

HPT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Heptane	Watery liquid      Colorless      Gasoline-like odor  Floats on water. Flammable vapor is produced.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Not irritating to eyes, nose or throat. If inhaled, will cause coughing or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. <b>DO NOT INDUCE VOMITING.</b>
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 31; Paraffin  
2.2 Formula: C<sub>7</sub>H<sub>16</sub>  
2.3 IMO/UN Designation: 3.2/1206  
2.4 DOT ID No.: 1206  
2.5 CAS Registry No.: 142-82-5  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51114

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Safety glasses; gloves; similar to gasoline.  
3.2 **Symptoms Following Exposure:** INHALATION: irritation of respiratory tract, coughing, depression, cardiac arrhythmias. ASPIRATION: severe lung irritation, pulmonary edema, mild excitement followed by depression. INGESTION: nausea, vomiting, swelling of abdomen, depression, headache.  
3.3 **Treatment of Exposure:** INHALATION: maintain respiration; give oxygen if needed. ASPIRATION: enforce bed rest; administer oxygen. INGESTION: do NOT induce vomiting. SKIN OR EYES: remove contaminated clothing, wipe and wash skin area with soap and water; wash eyes with plenty of water.  
3.4 **TLV-TWA:** 400 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 500 ppm.  
3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> above 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 220 ppm  
3.13 **IDLH Value:** 750 ppm  
3.14 **OSHA PEL-TWA:** 500 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 25°F C.C.  
4.2 **Flammable Limits in Air:** 1.0%-7.0%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 433°F  
4.8 **Electrical Hazards:** Class I, group D  
4.9 **Burning Rate:** 6.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub>diluent: 11.5-11.6%; CO<sub>2</sub> diluent: 14.5%

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
4924 ppm/24 hr/mosquito fish/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0% (theor.), 7 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Various grades, all greater than 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** (C)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 100.21  
9.3 **Boiling Point at 1 atm:** 209.1°F = 98.4°C = 371.6°K  
9.4 **Freezing Point:** -131°F = -90.6°C = 182.6°K  
9.5 **Critical Temperature:** 512.6°F = 267°C = 540.2°K  
9.6 **Critical Pressure:** 400 psia = 27 atm = 2.7 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.6838 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 19.3 dynes/cm = 0.0193 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 51 dynes/cm = 0.051 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.054  
9.12 **Latent Heat of Vaporization:** 136.1 Btu/lb = 75.61 cal/g= 3.166 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -19,170 Btu/lb = -10,650 cal/g = -445.9 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 33.78 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 1.8 psia

### NOTES

# HEPTANE

HPT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	43.730	0	0.498	-90	1.149	35	0.519
40	43.570	5	0.500	-80	1.138	40	0.502
45	43.410	10	0.502	-70	1.127	45	0.485
50	43.260	15	0.504	-60	1.115	50	0.469
55	43.100	20	0.507	-50	1.104	55	0.454
60	42.950	25	0.509	-40	1.092	60	0.440
65	42.790	30	0.511	-30	1.081	65	0.427
70	42.630	35	0.513	-20	1.069	70	0.414
75	42.480	40	0.515	-10	1.058	75	0.402
80	42.320	45	0.518	0	1.046	80	0.390
85	42.170	50	0.520	10	1.035	85	0.379
90	42.010	55	0.522	20	1.024	90	0.368
95	41.850	60	0.524	30	1.012	95	0.358
100	41.700	65	0.527	40	1.001	100	0.348
105	41.540	70	0.529	50	0.989	105	0.339
110	41.390	75	0.531	60	0.978	110	0.330
115	41.230	80	0.533	70	0.966	115	0.322
120	41.070	85	0.535	80	0.955	120	0.314
125	40.920	90	0.538	90	0.943	125	0.306
130	40.760	95	0.540	100	0.932	130	0.299
135	40.610	100	0.542	110	0.921	135	0.291
140	40.450	105	0.544	120	0.909	140	0.285
145	40.290	110	0.547	130	0.898	145	0.278
150	40.140	115	0.549	140	0.886	150	0.272
155	39.980	120	0.551	150	0.875	155	0.266
160	39.830	125	0.553	160	0.863	160	0.260

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	0	0.066	0	0.00134	0	0.345
	N	10	0.098	10	0.00195	25	0.362
	S	20	0.143	20	0.00279	50	0.378
	O	30	0.205	30	0.00391	75	0.394
	L	40	0.288	40	0.00538	100	0.410
	U	50	0.398	50	0.00729	125	0.426
	B	60	0.541	60	0.00972	150	0.442
	L	70	0.725	70	0.01279	175	0.457
	E	80	0.960	80	0.01660	200	0.472
		90	1.254	90	0.02129	225	0.487
		100	1.619	100	0.02701	250	0.501
		110	2.068	110	0.03389	275	0.516
		120	2.615	120	0.04211	300	0.530
		130	3.275	130	0.05184	325	0.544
		140	4.064	140	0.06326	350	0.557
		150	5.000	150	0.07657	375	0.570
		160	6.104	160	0.09196	400	0.584
		170	7.395	170	0.10960	425	0.596
		180	8.896	180	0.12980	450	0.609
		190	10.630	190	0.15270	475	0.621
		200	12.620	200	0.17860	500	0.633
		210	14.890	210	0.20760	525	0.645
		220	17.470	220	0.24000	550	0.657
		230	20.390	230	0.27600	575	0.668
		240	23.670	240	0.31590	600	0.679
		250	27.350	250	0.35980		

# HEXADECYL SULFATE, SODIUM SALT

HSS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cetyl sodium sulfate Sodium cetyl sulfate solution		Solid paste or liquid	White	Mild odor
May float or sink in water.				
Keep people away. Avoid contact with liquid and solid. Notify local health and pollution control agencies.				
<b>Fire</b>	Not Flammable.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CH}_3(\text{CH}_2)_{14}\text{CH}_2\text{OSO}_3\text{Na}\cdot\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51550

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Plastic or rubber gloves; goggles or face shield
- 3.2 Symptoms Following Exposure: Contact with eyes causes mild irritation. May cause skin to dry out and become irritated.
- 3.3 Treatment of Exposure: EYES OR SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 0.78 ppm/24 hr/oryzias/TL<sub>m</sub>
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid or liquid
- 9.2 Molecular Weight: Not pertinent (mixture)
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# HEXADECYL SULFATE, SODIUM SALT

HSS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R 7 6 + 3

# HEPTACHLOR

HTC

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms E3314 1,4,5,6,7,8,8a- Heptachlorodicyclopentadiene Velsicol	Solid	White to light tan	Camphor-like odor
	Sinks in water.		
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear goggles and self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.			
Fire	Not flammable. Irritating gases may be produced when heated.		
Exposure	DUST POISONOUS IF INHALED. If inhaled will cause headache or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>10</sub>H<sub>6</sub>Cl<sub>7</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 76-44-8  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Protective respirator; rubber gloves; clean clothes  
3.2 Symptoms Following Exposure: Inhalation of dust causes irritability, tremors, and collapse. Ingestion causes nausea, vomiting, diarrhea, and irritation of the gastrointestinal tract. Contact with dust causes irritation of eyes and moderate irritation of skin.  
3.3 Treatment of Exposure: Get medical attention following all overexposure to heptachlor. INHALATION: move to fresh air; if exposure to dust was severe, get medical attention. INGESTION: lavage stomach with warm tap water (unless convulsions are imminent); fats and oils should be avoided, as they increase the rate of absorption of all chlorinated hydrocarbons. EYES: wash repeatedly with water. SKIN: flush with water, then wash with soap and water.  
3.4 TLV-TWA: 0.05 mg/m<sup>3</sup>  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 4; oral LD<sub>50</sub> = 40 mg/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Liver damage may develop.  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: 0.02 ppm  
3.13 IDLH Value: 35 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 0.5 mg/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Irritating hydrogen chloride fumes may form in fire.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity:  
0.1 ppm/24 hr/trout/80% kill/fresh water  
0.230 ppm/96 hr/goldfish/TL<sub>50</sub>/fresh water  
0.25 ppm/48 hr/white shrimp/TL<sub>50</sub>/salt water  
6.2 Waterfowl Toxicity: 2000 mg/kg  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Bioconcentration of up to 17,600 in oysters and 300 in bluegills. A spill could cause potential problem with shellfish.  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Commercial, 72+%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed.  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 1 pound  
8.7 EPA Pollution Category: X  
8.8 RCRA Waste Number: P059  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 373.5  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: 115-165°F = 46-74°C = 319-347°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.66 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES



# HEPTACHLOR

HTC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 1-HEPTENE

HTE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Heptylene	Watery liquid Colorless Gasoline-like odor  Floats on water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_5\text{CH}=\text{CH}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2278  
2.5 CAS Registry No.: 592-76-7  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Safety goggles or face shield; similar to gasoline.  
3.2 **Symptoms Following Exposure:** High concentrations may produce slight irritation of eye and respiratory tract; may also act as simple asphyxiant and slight anesthetic.  
3.3 **Treatment of Exposure:** Remove from exposure. Administer artificial respiration if needed.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 25°F C.C. (est.)  
4.2 **Flammable Limits in Air:** LEL = 1.0%; UEL not listed  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 500°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 6.4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: (1)  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 98.18  
9.3 **Boiling Point at 1 atm:** 200.5°F = 93.6°C = 366.8°K  
9.4 **Freezing Point:** -182°F = -119°C = 154°K  
9.5 **Critical Temperature:** 507.4°F = 264.1°C = 537.3°K  
9.6 **Critical Pressure:** 420 psia = 28.57 atm = 2.89 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.697 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 20.5 dynes/cm = 0.0205 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.057  
9.12 **Latent Heat of Vaporization:** 137 Btu/lb = 76.3 cal/g =  $3.20 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -19,377 Btu/lb = -10,765 cal/g =  $-450.71 \times 10^3$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 30.82 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1-HEPTENE

HTE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	44.390	0	0.484	-5	0.939	40	0.412
50	44.080	10	0.488	0	0.935	50	0.388
60	43.780	20	0.493	5	0.930	60	0.366
70	43.470	30	0.497	10	0.926	70	0.346
80	43.170	40	0.501	15	0.921	80	0.328
90	42.860	50	0.506	20	0.917	90	0.312
100	42.560	60	0.510	25	0.912	100	0.297
110	42.250	70	0.514	30	0.908	110	0.283
120	41.950	80	0.519	35	0.904	120	0.270
130	41.640	90	0.523	40	0.899	130	0.258
140	41.340	100	0.527	45	0.895	140	0.247
150	41.030	110	0.532	50	0.890	150	0.237
160	40.730	120	0.536	55	0.886	160	0.227
170	40.420	130	0.540	60	0.881	170	0.219
180	40.120	140	0.545	65	0.877	180	0.211
190	39.810	150	0.549	70	0.872	190	0.203
		160	0.553	75	0.868		
		170	0.558	80	0.863		
				85	0.859		
				90	0.854		
				95	0.850		
				100	0.845		
				105	0.841		
				110	0.837		
				115	0.832		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	0	0.088	0	0.00174	0	0.333
	N	10	0.129	10	0.00251	25	0.348
	S	20	0.186	20	0.00354	50	0.363
	O	30	0.263	30	0.00491	75	0.377
	L	40	0.366	40	0.00670	100	0.391
	U	50	0.501	50	0.00899	125	0.405
	B	60	0.675	60	0.01188	150	0.419
	L	70	0.898	70	0.01551	175	0.432
	E	80	1.179	80	0.01998	200	0.446
		90	1.530	90	0.02545	225	0.459
		100	1.962	100	0.03206	250	0.472
		110	2.490	110	0.03998	275	0.485
		120	3.130	120	0.04939	300	0.498
		130	3.898	130	0.06045	325	0.510
		140	4.811	140	0.07338	350	0.523
		150	5.890	150	0.08836	375	0.535
		160	7.155	160	0.10560	400	0.547
		170	8.629	170	0.12530	425	0.559
		180	10.340	180	0.14780	450	0.571
		190	12.300	190	0.17310	475	0.582
		200	14.540	200	0.20160	500	0.594
		210	17.100	210	0.23350	525	0.605
						550	0.616
						575	0.627
						600	0.638

## HEPTANOL

HTN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Enanthic alcohol 1-Heptanol Heptyl alcohol 1-Hydroxyheptane	Watery liquid  Colorless  Weak alcohol odor  Floats on water.
Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	Not harmful.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_7H_{16}O$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 111-70-6  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51219

## 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Chemical goggles or face shield.  
3.2 Symptoms Following Exposure: Low toxicity; liquid may irritate eyes.  
3.3 Treatment of Exposure: Flush all affected parts with plenty of water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; oral rat  $LD_{50}$  = 1.87 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Nonirritating  
3.11 Liquid or Solid Characteristics: Liquid may irritate eyes; it is not irritating to skin.  
3.12 Odor Threshold: 0.49 ppm.  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

4.1 Flash Point: 170°F O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Foam, carbon dioxide, or dry chemical  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: 3.2 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 50.0 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 15.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 20.4% (theor.), 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: C  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 116.20  
9.3 Boiling Point at 1 atm: 349°F = 176°C = 449°K  
9.4 Freezing Point: -29°F = -34°C = 239°K  
9.5 Critical Temperature: 680.0°F = 360°C = 633.2°K  
9.6 Critical Pressure: 440 psia = 30 atm = 3.0 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.822 at 20°C (liquid)  
9.8 Liquid Surface Tension: 26.2 dynes/cm = 0.0262 N/mm at 15°C  
9.9 Liquid Water Interfacial Tension: 7.7 dynes/cm = 0.0077 N/m at 25°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.049  
9.12 Latent Heat of Vaporization: 189 Btu/lb = 105 cal/g = 4.40 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -15,810 Btu/lb = -8784 cal/g = -367.8 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# HEPTANOL

HTN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	52.140	0	0.418	30	1.064	55	9.131
50	51.850	10	0.429	40	1.057	60	8.244
60	51.560	20	0.441	50	1.051	65	7.458
70	51.270	30	0.453	60	1.044	70	6.759
80	50.970	40	0.464	70	1.038	75	6.137
90	50.680	50	0.476	80	1.031	80	5.583
100	50.390	60	0.488	90	1.025	85	5.087
110	50.100	70	0.499	100	1.018	90	4.643
120	49.810	80	0.511	110	1.011	95	4.245
130	49.520	90	0.523	120	1.005	100	3.887
140	49.230	100	0.534	130	0.998	105	3.565
150	48.940	110	0.546	140	0.992	110	3.275
160	48.640	120	0.558	150	0.985	115	3.012
170	48.350	130	0.569	160	0.979	120	2.775
180	48.060	140	0.581	170	0.972	125	2.560
190	47.770	150	0.593	180	0.966	130	2.365
200	47.480	160	0.604	190	0.959	135	2.188
210	47.190	170	0.616	200	0.952	140	2.026
		180	0.628				
		190	0.639				
		200	0.651				
		210	0.663				
		220	0.674				
		230	0.686				
		240	0.698				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.095	110	0.031	110	0.00060	0	0.326
36	0.096	120	0.045	120	0.00084	25	0.339
38	0.096	130	0.064	130	0.00117	50	0.353
40	0.096	140	0.089	140	0.00161	75	0.366
42	0.096	150	0.123	150	0.00219	100	0.380
44	0.097	160	0.169	160	0.00295	125	0.393
46	0.097	170	0.229	170	0.00394	150	0.406
48	0.097	180	0.308	180	0.00521	175	0.419
50	0.097	190	0.409	190	0.00682	200	0.431
52	0.098	200	0.540	200	0.00886	225	0.444
54	0.098	210	0.706	210	0.01142	250	0.456
56	0.098	220	0.917	220	0.01460	275	0.469
58	0.098	230	1.181	230	0.01854	300	0.481
60	0.099	240	1.510	240	0.02337	325	0.493
62	0.099	250	1.918	250	0.02926	350	0.505
64	0.099	260	2.420	260	0.03640	375	0.516
66	0.100	270	3.033	270	0.04500	400	0.528
68	0.100	280	3.779	280	0.05531	425	0.540
70	0.100	290	4.681	290	0.06760	450	0.551
72	0.100	300	5.766	300	0.08216	475	0.562
74	0.101	310	7.064	310	0.09934	500	0.573
76	0.101	320	8.608	320	0.11950	525	0.584
78	0.101	330	10.440	330	0.14310	550	0.595
80	0.101					575	0.606
82	0.102					600	0.616
84	0.102						

# N-HEXANE

HXA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hexane	Watery liquid Colorless Gasoline-like odor  Floats on water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to nose and throat. If inhaled, will cause coughing or dizziness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 31; Paraffin  
2.2 Formula:  $\text{CH}_2(\text{CH}_2)_4\text{CH}_3$   
2.3 IMO/UN Designation: 3.1/1208  
2.4 DOT ID No.: 1208  
2.5 CAS Registry No.: 110-54-3  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51114

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Eye protection (like gasoline).  
3.2 **Symptoms Following Exposure:** INHALATION causes irritation of respiratory tract, cough, mild depression, cardiac arrhythmias. ASPIRATION causes severe lung irritation, coughing, pulmonary edema; excitement followed by depression. INGESTION causes nausea, vomiting, swelling of abdomen, headache, depression.  
3.3 **Treatment of Exposure:** Call a doctor. INHALATION: maintain respiration; give oxygen if needed. ASPIRATION: enforce bed rest; give oxygen if needed. INGESTION: do NOT induce vomiting. SKIN OR EYES: wipe off; wash skin with soap and water; wash eyes with copious amounts of water.  
3.4 **TLV-TWA:** 50 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Very slight  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 1,100 ppm  
3.14 **OSHA PEL-TWA:** 500 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  $-7^{\circ}\text{F}$  C.C.  
4.2 **Flammable Limits in Air:** 1.2%-7.7%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Vapors may explode  
4.7 **Auto Ignition Temperature:**  $437^{\circ}\text{F}$   
4.8 **Electrical Hazards:** Class I, group D  
4.9 **Burning Rate:** 7.3 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 45.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0% (theor.), 7 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 0  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research grade; technical grade  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** (C)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at  $15^{\circ}\text{C}$  and 1 atm:** Liquid  
9.2 **Molecular Weight:** 86.17  
9.3 **Boiling Point at 1 atm:**  $155.7^{\circ}\text{F} = 68.7^{\circ}\text{C} = 341.9^{\circ}\text{K}$   
9.4 **Freezing Point:**  $-219.3^{\circ}\text{F} = -139.6^{\circ}\text{C} = 133.6^{\circ}\text{K}$   
9.5 **Critical Temperature:**  $453.6^{\circ}\text{F} = 234.2^{\circ}\text{C} = 507.4^{\circ}\text{K}$   
9.6 **Critical Pressure:** 436.6 psia = 29.7 atm = 3.01 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.659 at  $20^{\circ}\text{C}$  (liquid)  
9.8 **Liquid Surface Tension:** 18.4 dynes/cm = 0.0184 N/m at  $20^{\circ}\text{C}$   
9.9 **Liquid Water Interfacial Tension:** 51.1 dynes/cm = 0.0511 N/m at  $20^{\circ}\text{C}$   
9.10 **Vapor (Gas) Specific Gravity:** 3.0  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.063  
9.12 **Latent Heat of Vaporization:** 144 Btu/lb = 80.0 cal/g =  $3.35 \times 10^5$  J/kg  
9.13 **Heat of Combustion:**  $-19,246$  Btu/lb =  $-10,692$  cal/g =  $-447.65 \times 10^3$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 36.27 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 5.0 psia

NOTES

# N-HEXANE

HXA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	42.220	0	0.502	-5	0.933	35	0.334
40	42.060	10	0.508	0	0.927	40	0.330
45	41.890	20	0.513	5	0.921	45	0.327
50	41.730	30	0.519	10	0.914	50	0.324
55	41.570	40	0.524	15	0.908	55	0.321
60	41.400	50	0.530	20	0.902	60	0.318
65	41.240	60	0.535	25	0.895	65	0.315
70	41.070	70	0.541	30	0.889	70	0.312
75	40.910	80	0.547	35	0.883	75	0.309
80	40.740	90	0.552	40	0.876	80	0.306
85	40.580	100	0.558	45	0.870	85	0.304
90	40.410	110	0.563	50	0.863	90	0.301
95	40.250	120	0.569	55	0.857	95	0.298
100	40.080	130	0.574	60	0.851	100	0.296
105	39.920	140	0.580	65	0.844	105	0.294
110	39.750	150	0.585	70	0.838	110	0.291
115	39.590			75	0.832	115	0.289
120	39.420			80	0.825	120	0.287
125	39.260			85	0.819	125	0.285
130	39.090			90	0.813	130	0.282
135	38.930			95	0.806	135	0.280
140	38.760			100	0.800	140	0.278
145	38.600			105	0.794	145	0.276
				110	0.787		
				115	0.781		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	0	0.312	0	0.00545	0	0.350
	N	10	0.439	10	0.00750	25	0.365
	S	20	0.607	20	0.01016	50	0.381
	O	30	0.827	30	0.01355	75	0.396
	L	40	1.108	40	0.01781	100	0.411
	U	50	1.466	50	0.02308	125	0.426
	B	60	1.913	60	0.02955	150	0.440
	L	70	2.467	70	0.03740	175	0.455
	E	80	3.147	80	0.04681	200	0.469
		90	3.971	90	0.05799	225	0.484
		100	4.962	100	0.07116	250	0.498
		110	6.143	110	0.08656	275	0.512
		120	7.539	120	0.10440	300	0.526
		130	9.177	130	0.12490	325	0.539
		140	11.090	140	0.14840	350	0.553
		150	13.300	150	0.17510	375	0.566
		160	15.840	160	0.20520	400	0.579
		170	18.740	170	0.23890	425	0.592
		180	22.050	180	0.27670	450	0.605
		190	25.780	190	0.31860	475	0.618
		200	29.990	200	0.36490	500	0.630
		210	34.700	210	0.41600	525	0.642
						550	0.655
						575	0.667
						600	0.678

# 1-HEXENE

HXE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> alpha-Hexene Hexylene	Watery liquid Colorless Mild pleasant odor  Floats on water. Flammable, irritating vapor is produced.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_4\text{CH}=\text{CH}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2370  
2.5 CAS Registry No.: 592-41-6  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved organic vapor respirator or air-line mask; protective goggles or face shield.  
3.2 **Symptoms Following Exposure:** Inhalation may cause giddiness or incoordination similar to that from gasoline vapor. Prolonged exposure to high concentrations may induce loss of consciousness or death.  
3.3 **Treatment of Exposure:** SKIN OR EYES: wash exposed skin areas with soap and water; thoroughly flush eyes with water to remove any splashes; launder contaminated clothing before reuse.  
3.4 **TLV-TWA:** Notice of intended change: 30 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Slight smarting of the eyes or respiratory system if present in high concentrations. Effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -15°F C.C.  
4.2 **Flammable Limits in Air:** LEL (est.) = 1.2%; UEL not listed  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 521°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 8.1 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 1.5%, 7 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: (1)  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 95-98%; Pure, 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** (C)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 84.16  
9.3 **Boiling Point at 1 atm:** 146.3°F = 63.5°C = 336.7°K  
9.4 **Freezing Point:** -219.6°F = -139.8°C = 133.4°K  
9.5 **Critical Temperature:** 447.4°F = 230.8°C = 504°K  
9.6 **Critical Pressure:** 460 psia = 31.3 atm = 3.17 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.673 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 18.8 dynes/cm = 0.0188 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 31.6 dynes/cm = 0.0316 N/m at 22.7°C  
9.10 **Vapor (Gas) Specific Gravity:** 2.9  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.068  
9.12 **Latent Heat of Vaporization:** 140 Btu/lb = 80 cal/g =  $3.3 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -19,134 Btu/lb = -10,630 cal/g = -445.06  $\times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# 1-HEXENE

HXE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	43.100	0	0.488	0	0.937	70	0.257
40	42.930	10	0.492	5	0.931	75	0.251
45	42.770	20	0.497	10	0.924	80	0.245
50	42.600	30	0.501	15	0.917	85	0.240
55	42.440	40	0.505	20	0.910	90	0.234
60	42.270	50	0.510	25	0.903	95	0.229
65	42.110	60	0.514	30	0.896	100	0.224
70	41.940	70	0.518	35	0.889	105	0.219
75	41.780	80	0.523	40	0.882	110	0.214
80	41.620	90	0.527	45	0.876	115	0.210
85	41.450	100	0.531	50	0.869	120	0.206
90	41.290	110	0.536	55	0.862	125	0.202
95	41.120	120	0.540	60	0.855	130	0.198
100	40.960	130	0.544	65	0.848	135	0.194
105	40.790	140	0.549	70	0.841	140	0.190
110	40.630			75	0.834		
115	40.460			80	0.827		
120	40.300			85	0.821		
125	40.130			90	0.814		
130	39.970			95	0.807		
135	39.800			100	0.800		
140	39.640			105	0.793		
				110	0.786		
				115	0.779		
				120	0.772		
				125	0.766		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	0	0.406	0	0.00693	0	0.332
	N	10	0.567	10	0.00946	25	0.346
	S	20	0.776	20	0.01269	50	0.360
	O	30	1.048	30	0.01678	75	0.375
	L	40	1.393	40	0.02186	100	0.389
	U	50	1.828	50	0.02813	125	0.402
	B	60	2.369	60	0.03575	150	0.416
	L	70	3.035	70	0.04492	175	0.430
	E	80	3.845	80	0.05586	200	0.443
		90	4.822	90	0.06878	225	0.456
		100	5.990	100	0.08391	250	0.469
		110	7.375	110	0.10150	275	0.482
		120	9.003	120	0.12180	300	0.495
		130	10.900	130	0.14500	325	0.507
		140	13.110	140	0.17140	350	0.519
		150	15.650	150	0.20130	375	0.532
		160	18.560	160	0.23480	400	0.544
		170	21.870	170	0.27240	425	0.555
		180	25.630	180	0.31410	450	0.567
		190	29.850	190	0.36030	475	0.578
		200	34.600	200	0.41120	500	0.590
		210	39.890	210	0.46700	525	0.601
						550	0.612
						575	0.623
						600	0.633

# HEXYLENE GLYCOL

HXG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Methyl-2,4-pentanediol	Oily liquid	Colorless	Mild sweet odor
Floats and mixes slowly with water.			
Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $C_6H_{14}O_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51229

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Organic canister or air pack; rubber gloves; goggles  
3.2 Symptoms Following Exposure: Irritation of eyes, nose and throat; headache, dizziness, and nausea.  
3.3 Treatment of Exposure: INHALATION: remove victim to fresh air; if breathing has stopped, give artificial respiration. SKIN OR EYES: wash affected areas with water; flush eyes with water; get medical care if discomfort persists.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 25 ppm  
3.7 Toxicity by Ingestion: Grade 2;  $LD_{50} = 0.5$  to  $5$  g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 200°F O.C.  
4.2 Flammable Limits in Air: 1.2%-8.1% (calc.)  
4.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 583°F (calc.)  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 40.5 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 13.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 118.19  
9.3 Boiling Point at 1 atm: 387°F = 197°C = 470°K  
9.4 Freezing Point: -58°F = -50°C = 223°K  
9.5 Critical Temperature: 752.0°F = 400°C = 673.2°K  
9.6 Critical Pressure: 497 psia = 33.8 atm = 3.42 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.923 at 20°C (liquid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: 187 Btu/lb = 104 cal/g =  $4.35 \times 10^5$  J/kg  
9.13 Heat of Combustion: (est.) -13,600 Btu/lb = -7,550 cal/g =  $-316 \times 10^5$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: (est.) -11 Btu/lb = -6 cal/g =  $-0.25 \times 10^5$  J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# HEXYLENE GLYCOL

HXG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	58.500	34	0.421		N		N
50	58.190	36	0.422		O		O
60	57.890	38	0.423		T		T
70	57.580	40	0.424				
80	57.270	42	0.425		P		P
90	56.970	44	0.427		E		E
100	56.660	46	0.428		R		R
110	56.360	48	0.429		T		T
120	56.050	50	0.430		I		I
130	55.750	52	0.431		N		N
140	55.440	54	0.432		E		E
150	55.140	56	0.433		N		N
160	54.830	58	0.434		T		T
170	54.530	60	0.435				
180	54.220	62	0.437				
190	53.920	64	0.438				
200	53.610	66	0.439				
210	53.310	68	0.440				
		70	0.441				
		72	0.442				
		74	0.443				
		76	0.444				
		78	0.445				
		80	0.447				
		82	0.448				
		84	0.449				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	70	0.002	70	0.00003		N
	I	80	0.003	80	0.00005		O
	S	90	0.004	90	0.00008		T
	C	100	0.006	100	0.00012		
	I	110	0.009	110	0.00018		P
	B	120	0.014	120	0.00026		E
	L	130	0.020	130	0.00037		R
	E	140	0.029	140	0.00053		T
		150	0.041	150	0.00075		I
		160	0.059	160	0.00104		N
		170	0.082	170	0.00144		E
		180	0.114	180	0.00196		N
		190	0.156	190	0.00265		T
		200	0.212	200	0.00355		
		210	0.286	210	0.00470		
		220	0.382	220	0.00619		
		230	0.506	230	0.00807		
		240	0.664	240	0.01045		
		250	0.865	250	0.01342		
		260	1.119	260	0.01713		
		270	1.438	270	0.02170		
		280	1.835	280	0.02731		

# 1-HEXANOL

HXN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Amylcarbinol n-Amylcarbinol n-Hexanol n-Hexyl alcohol 1-Hydroxyhexane	Clear liquid  Colorless  Sweet odor  Floats on water.
<b>Keep people away. Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_4\text{CH}_2\text{OH}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2282  
2.5 CAS Registry No.: 111-27-3  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical gloves, chemical goggles.  
3.2 **Symptoms Following Exposure:** Liquid causes eye burns and skin irritation. Breathing vapors is not expected to cause systemic illness.  
3.3 **Treatment of Exposure:** In case of contact, immediately flush skin and eyes with plenty of water. Wash eyes at least 15 min. and get medical care.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to  $5 \text{ g/kg}$  (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 149°F O.C. 145°F C.C.  
4.2 **Flammable Limits in Air:** 1.2%-7.7% (calc.)  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 580°F (est.)  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 57%, 1-10 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 102.18  
9.3 **Boiling Point at 1 atm:** 314.8°F = 157.1°C = 430.3°K  
9.4 **Freezing Point:** -48.3°F = -44.6°C = 228.6°K  
9.5 **Critical Temperature:** 638.6°F = 337°C = 610.2°K  
9.6 **Critical Pressure:** 485 psia = 33 atm = 3.34 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.850 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 24.5 dynes/cm = 0.0245 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 6.8 dynes/cm = 0.0068 N/m at 25°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.057  
9.12 **Latent Heat of Vaporization:** 209 Btu/lb = 116 cal/g =  $4.86 \times 10^5 \text{ J/kg}$   
9.13 **Heat of Combustion:** -16,810 Btu/lb = -9340 cal/g =  $-391.0 \times 10^6 \text{ J/kg}$   
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.75 psia

### NOTES

# 1-HEXANOL

HXN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	54.160	0	0.424	30	1.059	35	0.950
50	53.750	10	0.437	35	1.056	40	0.860
60	53.330	20	0.450	40	1.054	45	0.781
70	52.910	30	0.462	45	1.051	50	0.710
80	52.500	40	0.475	50	1.048	55	0.647
90	52.080	50	0.488	55	1.045	60	0.590
100	51.670	60	0.501	60	1.042	65	0.540
110	51.250	70	0.513	65	1.039	70	0.494
120	50.830	80	0.526	70	1.037	75	0.453
130	50.420	90	0.539	75	1.034	80	0.417
140	50.000	100	0.552	80	1.031	85	0.383
150	49.580	110	0.565	85	1.028	90	0.353
160	49.170	120	0.577	90	1.025	95	0.326
170	48.750	130	0.590	95	1.023	100	0.301
180	48.340	140	0.603	100	1.020	105	0.279
190	47.920	150	0.616	105	1.017	110	0.258
200	47.500	160	0.628	110	1.014	115	0.240
210	47.090	170	0.641	115	1.011	120	0.223
		180	0.654	120	1.009	125	0.207
		190	0.667	125	1.006	130	0.193
		200	0.680	130	1.003	135	0.180
		210	0.692			140	0.168
		220	0.705			145	0.157
		230	0.718			150	0.147
		240	0.731			155	0.138

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.772	70	0.418	70	0.00751	0	0.323
36	0.764	80	0.510	80	0.00900	25	0.337
38	0.757	90	0.618	90	0.01071	50	0.350
40	0.749	100	0.744	100	0.01266	75	0.363
42	0.741	110	0.890	110	0.01488	100	0.376
44	0.733	120	1.058	120	0.01738	125	0.389
46	0.726	130	1.250	130	0.02019	150	0.402
48	0.718	140	1.469	140	0.02333	175	0.415
50	0.710	150	1.718	150	0.02682	200	0.427
52	0.702	160	1.998	160	0.03069	225	0.440
54	0.694	170	2.313	170	0.03496	250	0.452
56	0.687	180	2.665	180	0.03965	275	0.464
58	0.679	190	3.057	190	0.04479	300	0.476
60	0.671	200	3.492	200	0.05039	325	0.488
62	0.663	210	3.974	210	0.05649	350	0.499
64	0.656	220	4.505	220	0.06309	375	0.511
66	0.648	230	5.088	230	0.07023	400	0.523
68	0.640	240	5.727	240	0.07791	425	0.534
70	0.632	250	6.425	250	0.08617	450	0.545
72	0.624	260	7.184	260	0.09502	475	0.556
74	0.617	270	8.009	270	0.10450	500	0.567
76	0.609	280	8.902	280	0.11460	525	0.578
78	0.601	290	9.867	290	0.12530	550	0.589
80	0.593	300	10.910	300	0.13670	575	0.599
82	0.586	310	12.030	310	0.14870	600	0.610
84	0.578						

# HEXANOIC ACID

HXO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butylacetic acid n-Caproic acid Capronic acid Hexacid 698 n-Hexoxic acid NA 1760 (DOT) Pentyformic acid	Oily liquid  Colorless or slightly yellow  Goat-like odor (limberger cheese)  Floats on water, freezing pt. -5°C.
Avoid contact with liquid and vapor. Keep people away. Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Water may be ineffective on fire. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Wear self-contained breathing apparatus and protective clothing.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas, with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	May be dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 4; Organic acids
- 2.2 Formula: CH<sub>3</sub>(CH<sub>2</sub>)<sub>4</sub>CO<sub>2</sub>H
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: 1760
- 2.5 CAS Registry No.: 142-62-1
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respirator, chemical safety goggles, rubber boots and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** Harmful if swallowed, inhaled, or absorbed through skin. Material is extremely destructive to tissue of mucous membranes and upper respiratory tract, eyes and skin. Inhalation may be fatal as a result of spasm, inflammation and edema of the larynx and bronchia, chemical pneumonitis and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing give artificial respiration. If breathing is difficult give oxygen. SKIN: Flush with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes. EYES: Flush with copious amounts of water for at least 15 minutes. Insure adequate flushing of the eyes by separating the eyelids with the fingers.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 3 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Possibly mutagenic
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Currently not available.
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 220°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water spray, alcohol foam, dry chemical or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may not be effective.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapor may be generated.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Corrosive, attacks most common metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate solution
- 5.5 **Polymerization:** Will not occur
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 1
  - Human Oral hazard: 1
  - Human Contact hazard: I
  - Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.5+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive Material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** Currently not available.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 110.16
- 9.3 **Boiling Point at 1 atm:** 395.6-397.4°F = 202-203°C = 475.2-476.2°K
- 9.4 **Freezing Point:** 26.6°F = -3°C = 270.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.927
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 4.0
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Very low

### NOTES

# HEXANOIC ACID

HXO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	68	0.031

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.082	161 193 211 233 257 272 291 321 358 396	0.019 0.097 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.299 0.311 0.323 0.335 0.346 0.358 0.369 0.380 0.390 0.401 0.411 0.421 0.431 0.441 0.451 0.460 0.469 0.478 0.487 0.495 0.504 0.512 0.520 0.528 0.536

# HYDROGEN

HXX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> para-Hydrogen Liquid hydrogen	Gas Colorless Odorless  Floats and boils on water. Flammable visible vapor cloud is produced.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor.	
<b>Fire</b>	FLAMMABLE. Flame is almost invisible. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Evacuate surrounding area. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water.
<b>Exposure</b>	VAPOR If inhaled in high concentrations will cause difficult breathing, or loss of consciousness. Move victim to fresh air. If breathing has stopped, give artificial respiration.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: H<sub>2</sub>  
2.3 IMO/UN Designation: 2/1966  
(Refrigerated) 2/1049 (Compressed)  
2.4 DOT ID No.: 1966 (Refrigerated) 1049  
(Compressed)  
2.5 CAS Registry No.: 133-74-0  
2.6 NAERG Guide No.: 115  
2.7 Standard Industrial Trade Classification:  
52221

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety goggles or face shield; insulated gloves and long sleeves; cuffless trousers worn outside boots or over high-top shoes to shed spilled liquid; self-contained breathing apparatus containing air (never use oxygen).
- 3.2 **Symptoms Following Exposure:** If atmosphere does not contain enough oxygen, inhalation can cause dizziness, unconsciousness, or even death. Contact of liquid with eyes or skin causes freezing similar to burn.
- 3.3 **Treatment of Exposure:** The only effect of exposure to liquid hydrogen is that caused by its unusually low temperature and its action as a simple asphyxiant. INHALATION: if victim is unconscious (due to oxygen deficiency), move him to fresh air and apply resuscitation methods; call physician. EYES: treat for frostbite. SKIN: treat for frostbite; soak in lukewarm water; get medical attention if burn is severe.
- 3.4 **TLV-TWA:** Gas is non-poisonous but can act as a simple asphyxiant.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent (gas with low boiling point)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent
- 4.2 **Flammable Limits in Air:** 4.0%-75.0%
- 4.3 **Fire Extinguishing Agents:** Let fire burn; shut off gas supply.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Carbon dioxide
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Burns with an almost invisible flame.
- 4.7 **Auto Ignition Temperature:** 1,065°F
- 4.8 **Electrical Hazards:** Class I, Group B
- 4.9 **Burning Rate:** 9.9 mm/min.
- 4.10 **Adiabatic Flame Temperature:** 2497. (Est.)
- 4.11 **Stoichiometric Air to Fuel Ratio:** 2.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 1.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 5.0%; CO<sub>2</sub> diluent: 5.2%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Ambient temperature of water will cause vigorous vaporization of hydrogen.
- 5.2 **Reactivity with Common Materials:** No chemical reaction, but low temperature causes most materials to become very brittle.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** -434°F
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2.1
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0              |
| Flammability (Red).....   | 4              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 2.0
- 9.3 **Boiling Point at 1 atm:** -423°F = -253°C = 20°K
- 9.4 **Freezing Point:** -434°F = -259°C = 14°K
- 9.5 **Critical Temperature:** -400°F = -240°C = 33°K
- 9.6 **Critical Pressure:** 188 psia = 12.8 atm = 1.30 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.071 at -253°C (liquid)
- 9.8 **Liquid Surface Tension:** 2.3 dynes/cm = 0.023 N/m at -255°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 0.067
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.3962
- 9.12 **Latent Heat of Vaporization:** 190.5 Btu/lb = 105.8 cal/g = 4.427 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -50,080 Btu/lb = -27,823 cal/g = -1164.1 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 13.8 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Very High

### NOTES



# HYDROGEN

HXX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-426	4.531	-426	0.570	-425	0.795	-432	0.020
-425	4.493	-425	0.570	-424	0.804	-431	0.019
-424	4.455	-424	0.570	-423	0.813	-430	0.018
-423	4.417	-423	0.570			-429	0.017
						-428	0.016
						-427	0.015
						-426	0.015
						-425	0.014
						-424	0.014
						-423	0.013

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		-434	1.231	-434	0.00894	0	3.500
		-433	1.678	-433	0.01173	10	3.500
		-432	2.237	-432	0.01506	20	3.500
		-431	2.921	-431	0.01898	30	3.500
		-430	3.746	-430	0.02352	40	3.500
		-429	4.726	-429	0.02871	50	3.500
		-428	5.874	-428	0.03456	60	3.500
		-427	7.205	-427	0.04109	70	3.500
		-426	8.729	-426	0.04831	80	3.500
		-425	10.460	-425	0.05621	90	3.500
		-424	12.400	-424	0.06479	100	3.500
		-423	14.570	-423	0.07405	110	3.500
		-422	16.970	-422	0.08397	120	3.500
		-421	19.620	-421	0.09452	130	3.500
		-420	22.500	-420	0.10570	140	3.500
		-419	25.640	-419	0.11750	150	3.500
		-418	29.030	-418	0.12980	160	3.500
						170	3.500
						180	3.500
						190	3.500
						200	3.500
						210	3.500
						220	3.500
						230	3.500
						240	3.500
						250	3.500

# ISOAMYL ALCOHOL

IAA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Fermentation amyl alcohol Fusel oil Isobutylcarbinol Isopentyl alcohol 3-Methyl-1-butanol Potato spirit oil	Liquid  Colorless  Mild, choking alcohol odor  Floats and mixes with water. Irritating vapor is produced.
Keep people away. Call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to eyes. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Contain  
 Collection Systems: Skim  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
 2.2 Formula:  $(CH_3)_2CHCH_2CH_2OH$   
 2.3 IMO/UN Designation: 3.3/1105, 3.2/1201  
 2.4 DOT ID No.: 1105, 1201  
 2.5 CAS Registry No.: 123-51-3  
 2.6 NAERG Guide No.: 129  
 2.7 Standard Industrial Trade Classification: 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Face shield to avoid splash; protective breathing apparatus.  
 3.2 **Symptoms Following Exposure:** Very high vapor concentrations irritate eyes and upper respiratory tract. Continued contact with skin may cause irritation.  
 3.3 **Treatment of Exposure:** EYES: immediately flush with plenty of water for at least 15 min.; get medical attention. SKIN: flush with water; wash with soap and water.  
 3.4 **TLV-TWA:** 100 ppm  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** 125 ppm  
 3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5$  to  $5$  g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
 3.11 **Liquid or Solid Characteristics:** Liquid may irritate skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** 500 ppm  
 3.14 **OSHA PEL-TWA:** 100 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 114°F O.C.  
 4.2 **Flammable Limits in Air:** 1.2%-9.0% (212°F)  
 4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, alcohol foam, or carbon dioxide.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 662°F  
 4.8 **Electrical Hazards:** Class I, Group C  
 4.9 **Burning Rate:** 3.6 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 100 ppm/82 hr/goldfish/lethal/fresh water  
 400-600 ppm/24 hr/creek chub/critical range/river water  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** 156%, 5 days  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: -  
 Damage to living resources: -  
 Human Oral hazard: -  
 Human Contact hazard: -  
 Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure; fusel oil  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** D  
 7.6 **Ship Type:** Data not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 88.15  
 9.3 **Boiling Point at 1 atm:** 270°F = 132°C = 405°K  
 9.4 **Freezing Point:** Not pertinent  
 9.5 **Critical Temperature:** 584.6°F = 307°C = 580.2°K  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.81 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 23.8 dynes/cm = 0.0238 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** 5 dynes/cm = 0.005 N/m at 18°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.062  
 9.12 **Latent Heat of Vaporization:** 215.6 Btu/lb = 119.8 cal/g =  $5.016 \times 10^5$  J/kg  
 9.13 **Heat of Combustion:** -16,200 Btu/lb = -9,000 cal/g =  $-376.8 \times 10^5$  J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** -57.1 Btu/lb = -31.7 cal/g =  $-1.33 \times 10^5$  J/kg  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISOAMYL ALCOHOL

IAA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	51.720	40	0.511	75	0.953	34	8.196
40	51.560	50	0.524	80	0.951	36	7.875
45	51.400	60	0.537	85	0.948	38	7.570
50	51.250	70	0.551	90	0.946	40	7.278
55	51.090	80	0.564	95	0.943	42	7.000
60	50.940	90	0.577	100	0.941	44	6.735
65	50.780	100	0.591	105	0.938	46	6.482
70	50.620	110	0.604	110	0.936	48	6.240
75	50.470	120	0.617	115	0.934	50	6.009
80	50.310	130	0.631	120	0.931	52	5.788
85	50.160	140	0.644	125	0.929	54	5.577
90	50.000	150	0.657	130	0.926	56	5.375
95	49.840	160	0.671	135	0.924	58	5.182
100	49.690	170	0.684	140	0.921	60	4.997
105	49.530	180	0.697	145	0.919	62	4.820
110	49.380	190	0.711	150	0.917	64	4.651
115	49.220	200	0.724	155	0.914	66	4.489
120	49.060	210	0.737	160	0.912	68	4.334
				165	0.909	70	4.185
				170	0.907	72	4.043
						74	3.906
						76	3.775
						78	3.649
						80	3.528
						82	3.412
						84	3.301

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.750	40	0.012	40	0.00020	100	0.403
		50	0.019	50	0.00031	120	0.413
		60	0.030	60	0.00048	140	0.423
		70	0.046	70	0.00072	160	0.432
		80	0.070	80	0.00106	180	0.441
		90	0.104	90	0.00155	200	0.450
		100	0.152	100	0.00223	220	0.459
		110	0.220	110	0.00317	240	0.468
		120	0.314	120	0.00444	260	0.476
		130	0.442	130	0.00616	280	0.484
		140	0.616	140	0.00844	300	0.492
		150	0.849	150	0.01144	320	0.500
		160	1.158	160	0.01535	340	0.508
		170	1.565	170	0.02041	360	0.516
		180	2.094	180	0.02688	380	0.523
		190	2.777	190	0.03510	400	0.530
		200	3.651	200	0.04545	420	0.537
		210	4.761	210	0.05838	440	0.544
						460	0.551
						480	0.557
						500	0.564
						520	0.570
						540	0.576
						560	0.581
						580	0.587
						600	0.592

# ISOPROPYL ACETATE

IAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, isopropyl ester 2-Propyl acetate	Watery liquid	Colorless	Pleasant fruity odor
Floats and mixes slowly with water. Flammable, irritating vapor is produced.			
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula:  $\text{CH}_3\text{COOCH}(\text{CH}_3)_2$   
2.3 IMO/UN Designation: 3.2/1220  
2.4 DOT ID No.: 1220  
2.5 CAS Registry No.: 108-21-4  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor canister or air-supplied mask; chemical goggles or face splash shield.
- 3.2 **Symptoms Following Exposure:** Vapors irritate eyes and respiratory tract; high concentrations can be anesthetic. Liquid irritates eyes but causes no serious injury; may cause dermatitis; no serious effects if swallowed.
- 3.3 **Treatment of Exposure:** INHALATION: if victim is overcome by vapors, remove from exposure immediately; call a physician; if breathing is irregular or stopped, start resuscitation and administer oxygen. EYES: flush with water for at least 15 min.
- 3.4 **TLV-TWA:** 250 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 310 ppm
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50}$  = 0.5 to 5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 1,800 ppm
- 3.14 **OSHA PEL-TWA:** 250 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 60°F O.C. 37°F C.C.
- 4.2 **Flammable Limits in Air:** 1.8%-8.0%
- 4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 860°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 26%, 5 days (theor.)
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (1)  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95-99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester) or pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 102.13
- 9.3 **Boiling Point at 1 atm:** 191.3°F = 88.5°C = 361.7°K
- 9.4 **Freezing Point:** -92.7°F = -69.3°C = 203.9°K
- 9.5 **Critical Temperature:** 509.0°F = 265°C = 538.2°K
- 9.6 **Critical Pressure:** 529 psia = 36 atm = 3.65 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.874 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 26 dynes/cm = 0.026 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 3.5
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.074
- 9.12 **Latent Heat of Vaporization:** 150 Btu/lb = 81 cal/g =  $3.4 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** -9420 Btu/lb = -5230 cal/g =  $-219 \times 10^6$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 2.0 psia

### NOTES

# ISOPROPYL ACETATE

IAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	56.100	0	0.458	30	0.975	20	0.689
36	56.010	10	0.462	35	0.970	30	0.640
38	55.930	20	0.466	40	0.964	40	0.595
40	55.850	30	0.470	45	0.958	50	0.555
42	55.760	40	0.474	50	0.952	60	0.519
44	55.680	50	0.478	55	0.947	70	0.487
46	55.600	60	0.482	60	0.941	80	0.458
48	55.510	70	0.486	65	0.935	90	0.431
50	55.430	80	0.490	70	0.930	100	0.407
52	55.350	90	0.493	75	0.924	110	0.385
54	55.270	100	0.497	80	0.918	120	0.365
56	55.180	110	0.501	85	0.912	130	0.347
58	55.100	120	0.505	90	0.907	140	0.330
60	55.020	130	0.509	95	0.901	150	0.314
62	54.930	140	0.513	100	0.895	160	0.300
64	54.850	150	0.517	105	0.890	170	0.287
66	54.770	160	0.521	110	0.884		
68	54.680	170	0.525	115	0.878		
70	54.600	180	0.528	120	0.872		
72	54.520	190	0.532	125	0.867		
74	54.430			130	0.861		
76	54.350			135	0.855		
78	54.270			140	0.850		
80	54.180			145	0.844		
82	54.100			150	0.838		
84	54.020			155	0.832		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.900	20	0.153	20	0.00304	100	0.298
		30	0.224	30	0.00436	120	0.307
		40	0.322	40	0.00613	140	0.315
		50	0.454	50	0.00848	160	0.323
		60	0.629	60	0.01152	180	0.332
		70	0.859	70	0.01542	200	0.340
		80	1.154	80	0.02035	220	0.348
		90	1.530	90	0.02648	240	0.356
		100	2.003	100	0.03405	260	0.364
		110	2.591	110	0.04328	280	0.372
		120	3.315	120	0.05441	300	0.379
		130	4.197	130	0.06771	320	0.387
		140	5.261	140	0.08347	340	0.394
		150	6.536	150	0.10200	360	0.401
		160	8.049	160	0.12360	380	0.408
		170	9.833	170	0.14860	400	0.415
		180	11.920	180	0.17730	420	0.422
		190	14.350	190	0.21010	440	0.429
		200	17.150	200	0.24730		
		210	20.360	210	0.28930		
		220	24.040	220	0.33650		
		230	28.210	230	0.38920		
		240	32.930	240	0.44770		

# ISODECYL ACRYLATE

IAI

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid      Colorless      Weak odor

Floats on water.

Keep people away.  
Call fire department.  
Notify local health and pollution control agencies.

### Fire

Combustible.  
Extinguish with dry chemicals, foam or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

Call for medical aid.  
  
LIQUID  
Irritating to skin and eyes.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 14; Acrylate  
2.2 Formula:  $\text{CH}_2=\text{CHCOOC}_{10}\text{H}_{21}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 1330-61-6  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51379

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Inhalation causes mild irritation of nose and throat. Eyes are mildly irritated by vapor, more severely by liquid. Prolonged contact of liquid with skin may cause irritation.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air. EYES: flush with water for at least 15 min. after contact with liquid. SKIN: wipe off, wash well with soap and water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1;  $\text{LD}_{50} = 5$  to 15 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 240°F O.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** May polymerize to gummy solid. Reaction is not violent.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 85.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 25.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable if inhibited.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** In the absence of inhibitor, polymerization will occur, especially when heated.
- 5.6 **Inhibitor of Polymerization:** Monomethyl ether of hydroquinone, 25 ppm

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97.5+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** A
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 212.4
- 9.3 **Boiling Point at 1 atm:** Not pertinent (polymerizes)
- 9.4 **Freezing Point:**  $-148^{\circ}\text{F} = -100^{\circ}\text{C} = 173^{\circ}\text{K}$
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.885 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** 110 Btu/lb = 61 cal/g =  $2.6 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** (est.)  $-16,300$  Btu/lb =  $-9,100$  cal/g =  $-380 \times 10^5$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** (est.)  $-119$  Btu/lb =  $-66$  cal/g =  $-2.8 \times 10^5$  J/kg
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Low

## NOTES

# ISODECYL ACRYLATE

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	56.420	34	0.441	42	1.048	35	4.146
36	56.350	36	0.442	44	1.048	40	3.792
38	56.280	38	0.443	46	1.048	45	3.474
40	56.210	40	0.444	48	1.048	50	3.189
42	56.150	42	0.446	50	1.048	55	2.932
44	56.080	44	0.447	52	1.048	60	2.700
46	56.010	46	0.448	54	1.048	65	2.490
48	55.940	48	0.449	56	1.048	70	2.300
50	55.870	50	0.450	58	1.048	75	2.128
52	55.800	52	0.451	60	1.048	80	1.971
54	55.730	54	0.452	62	1.048	85	1.829
56	55.660	56	0.453	64	1.048	90	1.699
58	55.590	58	0.454	66	1.048	95	1.580
60	55.520	60	0.456	68	1.048	100	1.472
62	55.450	62	0.457	70	1.048		
64	55.380	64	0.458	72	1.048		
66	55.310	66	0.459	74	1.048		
68	55.240	68	0.460	76	1.048		
70	55.170	70	0.461				
72	55.100	72	0.462				
74	55.040	74	0.463				
76	54.970	76	0.464				
		78	0.466				
		80	0.467				
		82	0.468				
		84	0.469				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.010	304	0.792	304	0.02053		N
		306	0.817	306	0.02113		O
		308	0.843	308	0.02174		T
		310	0.870	310	0.02236		
		312	0.897	312	0.02300		P
		314	0.925	314	0.02365		E
		316	0.953	316	0.02432		R
		318	0.983	318	0.02500		T
		320	1.013	320	0.02570		I
		322	1.043	322	0.02641		N
		324	1.075	324	0.02714		E
		326	1.107	326	0.02789		N
		328	1.140	328	0.02865		T
		330	1.174	330	0.02943		
		332	1.209	332	0.03022		
		334	1.245	334	0.03103		
		336	1.281	336	0.03186		
		338	1.319	338	0.03271		

# ISOBUTYL ALCOHOL

IAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Fermentation butyl alcohol Isobutanol Isopropylcarbinol 2-Methyl-1-propanol	Oily liquid  Colorless  Mild alcohol, choking odor  Floats and mixes slowly with water. Irritating vapor is produced.
Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, dizziness, or headache. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to eyes. Harmful if swallowed. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula: (CH<sub>3</sub>)CHCH<sub>2</sub>OH  
2.3 IMO/UN Designation: 3.3/1212  
2.4 DOT ID No.: 1212  
2.5 CAS Registry No.: 78-83-1  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51213

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air pack or organic canister; chemical goggles.  
3.2 **Symptoms Following Exposure:** Contact with eyes is extremely irritating and may cause burns. Breathing vapors will be irritating to the nose and throat. In high concentrations, may cause nausea, dizziness, headache, and stupor.  
3.3 **Treatment of Exposure:** INHALATION: if victim is overcome by vapors, remove him from exposure immediately; call a physician; if breathing is irregular or has stopped, start resuscitation; administer oxygen. EYES: flush with water for at least 15 min.  
3.4 **TLV-TWA:** 50 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 1,600 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 90°F O.C. 82°F C.C.  
4.2 **Flammable Limits in Air:** 1.6%-10.9%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 800°F  
4.8 **Electrical Hazards:** Class I, group D  
4.9 **Burning Rate:** 3.5 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 20.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 4680 ppm/1 hr/fish/lethal/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 162%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** U140  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 74.12  
9.3 **Boiling Point at 1 atm:** 226.2°F = 107.9°C = 381.1°K  
9.4 **Freezing Point:** -162°F = -108°C = 165°K  
9.5 **Critical Temperature:** 526.3°F = 274.6°C = 547.8°K  
9.6 **Critical Pressure:** 623 psia = 42.4 atm = 4.30 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.802 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 248 Btu/lb = 138 cal/g = 5.78 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -14,220 Btu/lb = -7,900 cal/g = -330.8 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ISOBUTYL ALCOHOL

IAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	50.920	-50	0.461	45	0.930	N O T  P E R T I N E N T	
40	50.790	-40	0.469	50	0.927		
45	50.660	-30	0.477	55	0.924		
50	50.530	-20	0.484	60	0.920		
55	50.400	-10	0.492	65	0.917		
60	50.270	0	0.500	70	0.914		
65	50.140	10	0.508	75	0.911		
70	50.010	20	0.516	80	0.908		
75	49.880	30	0.523	85	0.904		
80	49.750	40	0.531	90	0.901		
85	49.620	50	0.539	95	0.898		
90	49.490	60	0.547	100	0.895		
95	49.360	70	0.554	105	0.892		
100	49.230	80	0.562	110	0.888		
105	49.100	90	0.570	115	0.885		
110	48.970	100	0.578	120	0.882		
115	48.840	110	0.586	125	0.879		
120	48.710	120	0.593	130	0.876		
		130	0.601				
		140	0.609				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	8.500	55	0.091	55	0.00122	0	0.352
		60	0.112	60	0.00149	25	0.365
		65	0.137	65	0.00181	50	0.379
		70	0.167	70	0.00218	75	0.392
		75	0.204	75	0.00263	100	0.404
		80	0.247	80	0.00316	125	0.417
		85	0.298	85	0.00377	150	0.429
		90	0.358	90	0.00450	175	0.441
		95	0.429	95	0.00534	200	0.453
		100	0.513	100	0.00633	225	0.465
		105	0.611	105	0.00747	250	0.476
		110	0.726	110	0.00880	275	0.487
		115	0.860	115	0.01033	300	0.498
		120	1.015	120	0.01209	325	0.509
		125	1.195	125	0.01411	350	0.520
		130	1.403	130	0.01643	375	0.530
		135	1.642	135	0.01907	400	0.540
		140	1.918	140	0.02209	425	0.550
		145	2.234	145	0.02551	450	0.560
		150	2.596	150	0.02940	475	0.570
		155	3.009	155	0.03380	500	0.579
						525	0.588
						550	0.597
						575	0.606
						600	0.615

# ISOBUTYLAMINE

IAM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Amino-2-methylpropane iso-Butylamine Monoisobutylamine	Liquid  Colorless  Strong ammonia odor  Floats and mixes with water.
Evacuate. Keep people away. Shut off ignition sources. Call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing, difficult breathing or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amine  
2.2 Formula:  $(CH_3)_2CHCH_2NH_2$   
2.3 IMO/UN Designation: 3.2/1214  
2.4 DOT ID No.: 1214  
2.5 CAS Registry No.: 78-81-9  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; butyl rubber gloves; chemical face shield; butyl rubber apron  
3.2 **Symptoms Following Exposure:** Inhalation causes severe coughing and chest pain due to irritation of air passages; can cause lung edema. Compound is sympathomimetic and is also a cardiac depressant and convulsant; ingestion causes nausea and profuse salivation. Contact with eyes causes severe irritation and edema of the cornea. Contact with skin causes severe irritation.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if not breathing, give artificial respiration; if breathing is difficult, give oxygen; call a physician. INGESTION: give large amount of water followed by dilute vinegar or lemon juice; keep patient warm. EYES: flush with water for 15 min. SKIN: flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral  $LD_{50}$  = 120 mg/kg (rabbit), 250 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 15°F C.C.  
4.2 **Flammable Limits in Air:** 3.4%-9%  
4.3 **Fire Extinguishing Agents:** Dry chemical, "alcohol" foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may be formed in fire.  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back. Containers may explode.  
4.7 **Auto Ignition Temperature:** 712°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 6.03 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 36.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 73.1  
9.3 **Boiling Point at 1 atm:** 153.3°F = 67.4°C = 340.6°K  
9.4 **Freezing Point:** -121.9°F = -85.5°C = 187.7°K  
9.5 **Critical Temperature:** 469.4°F = 243.0°C = 516.2°K  
9.6 **Critical Pressure:** 620 psia = 42 atm = 4.3 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.739 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 23.70 dynes/cm = 0.0237 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.073 at 20°C  
9.12 **Latent Heat of Vaporization:** 182 Btu/lb = 101 cal/g = 4.23 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -17,550 Btu/lb = -9,760 cal/g = -408 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -148 Btu/lb = -82 cal/g = 3.4 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 2.4 psia

### NOTES

# ISOBUTYLAMINE

IAM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	47.310	68	0.633		N	77	0.550
36	47.240	69	0.633		O		
38	47.170	70	0.633		T		
40	47.100	71	0.633				
42	47.030	72	0.633		P		
44	46.960	73	0.633		E		
46	46.890	74	0.633		R		
48	46.820	75	0.633		T		
50	46.750	76	0.633		I		
52	46.680	77	0.633		N		
54	46.620	78	0.633		E		
56	46.550	79	0.633		N		
58	46.480	80	0.633		T		
60	46.410	81	0.633				
62	46.340	82	0.633				
64	46.270	83	0.633				
66	46.200	84	0.633				
68	46.130	85	0.633				
70	46.060						
72	45.990						
74	45.920						
76	45.850						
78	45.780						
80	45.710						
82	45.640						
84	45.580						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	0	0.252	0	0.00373	0	0.357
	I	10	0.364	10	0.00528	25	0.372
	S	20	0.516	20	0.00733	50	0.387
	C	30	0.719	30	0.01000	75	0.402
	I	40	0.984	40	0.01342	100	0.417
	B	50	1.327	50	0.01773	125	0.431
	L	60	1.764	60	0.02312	150	0.445
	E	70	2.314	70	0.02975	175	0.459
		80	2.998	80	0.03783	200	0.473
		90	3.840	90	0.04757	225	0.486
		100	4.865	100	0.05919	250	0.499
		110	6.101	110	0.07293	275	0.512
		120	7.580	120	0.08905	300	0.525
		130	9.334	130	0.10780	325	0.537
		140	11.400	140	0.12940	350	0.549
		150	13.810	150	0.15430	375	0.561
		160	16.610	160	0.18250	400	0.573
		170	19.840	170	0.21450	425	0.585
		180	23.540	180	0.25060	450	0.596
		190	27.750	190	0.29090	475	0.607
		200	32.530	200	0.33580	500	0.618
						525	0.629
						550	0.639
						575	0.650
						600	0.660

# ISOAMYLACETATE

IAT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Banana oil Isoamyl ethanoate Isopentyl acetate Pear oil	Oily liquid                      Colorless                      Banana odor  Floats and mixes with water. Flammable, irritating vapor is produced
Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause nausea, headache or dizziness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk.
<b>Water Pollution</b>	<b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control official. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Contain  
 Collection Systems: Skim

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 34; Ester  
 2.2 **Formula:** CH<sub>3</sub>COOCH<sub>2</sub>CH<sub>2</sub>CH(CH<sub>3</sub>)<sub>2</sub>  
 2.3 **IMO/UN Designation:** 3.3/1104  
 2.4 **DOT ID No.:** 1104  
 2.5 **CAS Registry No.:** 123-92-2  
 2.6 **NAERG Guide No.:** 129  
 2.7 **Standard Industrial Trade Classification:** 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, chemical goggles or face shield, and lab coat.  
 Organic vapor chemical cartridge respirator for less than 1000 ppm; self-contained breathing apparatus for greater than 1000 ppm.
- 3.2 **Symptoms Following Exposure:** INHALATION OR INGESTION: Irritates the mucous membrane, depresses the central nervous system and is narcotic. Damage to kidney, liver, and lung can occur. Ingestion can also damage the gastro-intestinal tract. EYES: Irritation. SKIN: Has a defatting action on the skin and may cause dermatitis.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove from exposure. Administer oxygen if needed. EYES: Flush with water for at least 15 min. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. Subsequent treatment is symptomatic and supportive in nature.
- 3.4 **TLV-TWA:** 100 ppm.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 - 15 g/kg.  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentration. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 0.015 ppm in air. 0.0006 ppm in water.  
 3.13 **IDLH Value:** 1,000 ppm  
 3.14 **OSHA PEL-TWA:** 100 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 77°F C.C.  
 4.2 **Flammable Limits in Air:** 1.0%-7.5%.  
 4.3 **Fire Extinguishing Agents:** Alcohol foam, CO<sub>2</sub>, or dry chemical.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
 4.5 **Special Hazards of Combustion Products:** When heated emits acrid fumes.  
 4.6 **Behavior in Fire:** When exposed to flames can react vigorously with reducing materials.  
 4.7 **Auto Ignition Temperature:** 680°F.  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 45.2 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 65 ppm/24-96 hr/mosquito fish/TL<sub>m</sub>/turbid water  
 120 ppm/48 hr/daphnia/TL<sub>m</sub>/23°C.  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** 38% (time unknown). 0.31 lb/lb; 5 days.  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 2  
 Human Oral hazard: 0  
 Human Contact hazard: I  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
 7.2 **Storage Temperature:** Ambient (cool).  
 7.3 **Inert Atmosphere:** Currently not available  
 7.4 **Venting:** Currently not available  
 7.5 **IMO Pollution Category:** C  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** III  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 130.18  
 9.3 **Boiling Point at 1 atm:** 287.6°F = 142°C = 415.2°K  
 9.4 **Freezing Point:** -109.3°F = -78.5°C = 194.7°K  
 9.5 **Critical Temperature:** 619.0°F = 326.1°C = 599.3°K  
 9.6 **Critical Pressure:** 411.5 psia = 28.0 atm = 2.84 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.876 at 15°C.  
 9.8 **Liquid Surface Tension:** 24.77 dynes/cm = 0.02477 N/m at 20°C.  
 9.9 **Liquid Water Interfacial Tension:** 50.2 dynes/cm = 0.0502 N/m at 15°C.  
 9.10 **Vapor (Gas) Specific Gravity:** 4.5  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) > 1 - 1.1  
 9.12 **Latent Heat of Vaporization:** (est.) 132 Btu/lb = 73.3 cal/g = 3.07 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -14,402 Btu/lb = -8000 cal/g = 334.9 X 10<sup>3</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISOAMYLACETATE

IAT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
59	54.690		C	35	0.928	46	1.032
60	54.627		U	40	0.924	48	1.011
61	54.563		R	45	0.920	50	0.992
62	54.500		R	50	0.915	52	0.974
63	54.437		E	55	0.911	54	0.958
64	54.373		N	60	0.907	56	0.943
65	54.310		T	65	0.903	58	0.929
66	54.247		L	70	0.898	60	0.916
67	54.183		Y	75	0.894	62	0.904
68	54.120			80	0.890	64	0.892
			N	85	0.885	66	0.881
			O	90	0.881		
			T	95	0.877		
				100	0.872		
			A	105	0.868		
			V	110	0.864		
			A	115	0.859		
			I	120	0.855		
			L				
			A				
			B				
			L				
			E				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
59	0.250	40	-1.247	40	0.04360		C
		60	-0.255	60	0.02693		U
		80	0.737	80	0.01026		R
		100	0.271	100	0.00640		R
		120	1.279	120	0.02307		E
		140	2.287	140	0.03973		N
		160	3.295	160	0.05640		T
		180	4.303	180	0.07306		L
		200	5.311	200	0.08973		Y
		220	6.320	220	0.10639		
		240	7.328	240	0.12306		N
		260	8.336	260	0.13972		O
		280	9.344	280	0.15639		T
							A
							V
							A
							L
							A
							B
							L
							E

# ISOBUTYL ACETATE

IBA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, isobutyl ester 2-Methyl-1-propyl acetate beta-Methylpropyl ethanoate	Watery liquid  Colorless  Pleasant fruity odor  Floats on water. Flammable, irritating vapor is produced.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. May explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, dizziness, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Ester  
2.2 Formula:  $\text{CH}_3\text{COOCH}_2\text{CH}(\text{CH}_3)_2$   
2.3 IMO/UN Designation: 3.2/1213  
2.4 DOT ID No.: 1213  
2.5 CAS Registry No.: 110-19-0  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air pack or organic canister mask; chemical goggles.  
3.2 **Symptoms Following Exposure:** Vapors may irritate upper respiratory tract and cause nausea, vomiting, dizziness and loss of consciousness. Liquid irritates eyes and may irritate skin.  
3.3 **Treatment of Exposure:** INHALATION: remove from exposure; if breathing is irregular or has stopped, start resuscitation and give oxygen; call a doctor. EYES: flush with water for at least 15 minutes.  
3.4 **TLV-TWA:** 150 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 1,300 ppm  
3.14 **OSHA PEL-TWA:** 150 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 85°F O.C. 62°F C.C.  
4.2 **Flammable Limits in Air:** 2.4%-10.5%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide and dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 793°F  
4.8 **Electrical Hazards:** Class I, group D  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Softens and dissolves many plastics  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 1200 ppm/24 hr/brine shrimp/TL<sub>m</sub>  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 47% of theoretical in 5 days, freshwater, acclimated seed  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95-99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 116.16  
9.3 **Boiling Point at 1 atm:** 243.1°F = 117.3°C = 390.5°K  
9.4 **Freezing Point:** -142.8°F = -97.1°C = 176.1°K  
9.5 **Critical Temperature:** 564.8°F = 296°C = 569.2°K  
9.6 **Critical Pressure:** 470 psia = 32 atm = 3.2 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.871 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 23.7 dynes/cm = 0.0237 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 133 Btu/lb = 73.7 cal/g = 3.09 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -13,000 Btu/lb = -7220 cal/g = -302 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.4 psia

### NOTES

# ISOBUTYL ACETATE

IBA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	55.570	40	0.449	32	1.040	40	0.922
40	55.390	50	0.453	34	1.040	50	0.843
45	55.210	60	0.456	36	1.040	60	0.773
50	55.030	70	0.460	38	1.040	70	0.711
55	54.850	80	0.464	40	1.040	80	0.657
60	54.670	90	0.467	42	1.040	90	0.608
65	54.490	100	0.471	44	1.040	100	0.564
70	54.310	110	0.475	46	1.040	110	0.525
75	54.130	120	0.478	48	1.040	120	0.490
80	53.950	130	0.482	50	1.040	130	0.458
85	53.770	140	0.486	52	1.040	140	0.430
90	53.590	150	0.489	54	1.040	150	0.404
95	53.410	160	0.493	56	1.040	160	0.380
100	53.230	170	0.497	58	1.040	170	0.358
		180	0.500	60	1.040	180	0.338
		190	0.504	62	1.040	190	0.320
		200	0.508	64	1.040	200	0.304
		210	0.511	66	1.040	210	0.288
		220	0.515				
		230	0.519				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.600	60	0.188	60	0.00392	0	0.332
		70	0.264	70	0.00539	25	0.351
		80	0.364	80	0.00731	50	0.371
		90	0.495	90	0.00975	75	0.391
		100	0.664	100	0.01285	100	0.411
		110	0.879	110	0.01671	125	0.431
		120	1.150	120	0.02147	150	0.451
		130	1.487	130	0.02729	175	0.472
		140	1.902	140	0.03432	200	0.493
		150	2.408	150	0.04274	225	0.514
		160	3.021	160	0.05275	250	0.535
		170	3.756	170	0.06455	275	0.556
		180	4.631	180	0.07834	300	0.578
		190	5.665	190	0.09436	325	0.600
		200	6.878	200	0.11280	350	0.622
		210	8.293	210	0.13400	375	0.645
		220	9.932	220	0.15810	400	0.667
		230	11.820	230	0.18550	425	0.690
		240	13.980	240	0.21620	450	0.713
		250	16.450	250	0.25080	475	0.736
		260	19.240	260	0.28930	500	0.760
		270	22.400	270	0.33210	525	0.783
		280	25.940	280	0.37950	550	0.807
		290	29.900	290	0.43170	575	0.831
		300	34.320	300	0.48890	600	0.856

# ISOBUTYLENE

IBL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isobutene 2-Methylpropene		Liquefied compressed gas Colorless Sweet gasoline-like odor
		Floats and boils on water. Flammable visible vapor cloud is produced.
Evacuate. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid. Notify local health and pollution control agencies.		
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water. Let fire burn. Extinguish small fires with water, dry chemical, or carbon dioxide.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause dizziness, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.	
<b>Water Pollution</b>	Not harmful to aquatic life.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $(CH_3)_2C=CH_2$   
2.3 IMO/UN Designation: 2/1055  
2.4 DOT ID No.: 1055  
2.5 CAS Registry No.: 115-11-7  
2.6 NAERG Guide No.: 115  
2.7 Standard Industrial Trade Classification: 51113

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical gloves and eye protection; organic vapor canister or self-contained breathing apparatus.  
3.2 **Symptoms Following Exposure:** Inhalation of moderate concentrations causes dizziness, drowsiness, and unconsciousness. Contact with eyes or skin may cause irritation; the liquid may cause frostbite.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air and apply resuscitation; call a physician promptly if victim is unconscious. EYES: if irritated, wash with water. SKIN: if irritated, wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Not pertinent  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to eyes and throat.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to skin because it is very volatile and evaporate quickly. May cause frostbite.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Gas  
4.2 **Flammable Limits in Air:** 1.8%-9.6%  
4.3 **Fire Extinguishing Agents:** Let fire burn, stop flow of gas. Water fog, dry chemical, or carbon dioxide may be used for small fires.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Containers may explode in fire. Vapor is heavier than air and may travel a long distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 869°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None  
6.2 **Waterfowl Toxicity:** None  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas  
8.2 **49 CFR Class:** 2.1  
8.3 **49 CFR Package Group:** Not pertinent.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
9.2 **Molecular Weight:** 56.10  
9.3 **Boiling Point at 1 atm:** 19.6°F = -6.9°C = 266.3°K  
9.4 **Freezing Point:** -220°F = -140.3°C = 132.9°K  
9.5 **Critical Temperature:** 292.5°F = -144.7°C = 417.9°K  
9.6 **Critical Pressure:** 580 psia = 39.48 atm = 3.99 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.59 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 15.8 dynes/cm = 0.0158 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at -10°C  
9.10 **Vapor (Gas) Specific Gravity:** 1.9  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.061  
9.12 **Latent Heat of Vaporization:** 170 Btu/lb = 94.3 cal/g = 3.95 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -19,359 Btu/lb = -10,755 cal/g = -450.29 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 25.25 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES



# ISOBUTYLENE

IBL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
N O T  P E R T I N E N T		-20	0.498	-115	1.175	-20	0.195
		-15	0.501	-110	1.160	-10	0.190
		-10	0.504	-105	1.145	0	0.184
		-5	0.507	-100	1.130	10	0.179
		0	0.510	-95	1.115		
		5	0.513	-90	1.100		
		10	0.516	-85	1.085		
		15	0.520	-80	1.070		
				-75	1.054		
				-70	1.039		
				-65	1.024		
				-60	1.009		
				-55	0.994		
				-50	0.979		
				-45	0.964		
				-40	0.949		
				-35	0.934		
				-30	0.919		
				-25	0.904		
				-20	0.889		
				-15	0.874		
				-10	0.859		
				-5	0.844		
				0	0.829		
				5	0.814		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		-55	2.182	-55	0.02818	0	0.597
		-50	2.534	-50	0.03233	25	0.606
		-45	2.933	-45	0.03696	50	0.614
		-40	3.382	-40	0.04212	75	0.623
		-35	3.887	-35	0.04783	100	0.632
		-30	4.453	-30	0.05416	125	0.640
		-25	5.085	-25	0.06114	150	0.649
		-20	5.789	-20	0.06882	175	0.657
		-15	6.572	-15	0.07724	200	0.665
		-10	7.440	-10	0.08647	225	0.673
		-5	8.400	-5	0.09655	250	0.681
		0	9.458	0	0.10750	275	0.689
		5	10.620	5	0.11950	300	0.697
		10	11.900	10	0.13240	325	0.705
		15	13.300	15	0.14640	350	0.713
		20	14.830	20	0.16160	375	0.720
		25	16.500	25	0.17790	400	0.728
		30	18.320	30	0.19550	425	0.735
		35	20.290	35	0.21440	450	0.743
		40	22.430	40	0.23460	475	0.750
		45	24.750	45	0.25630	500	0.757
		50	27.260	50	0.27950	525	0.764
		55	29.960	55	0.30420	550	0.771
		60	32.870	60	0.33060	575	0.778
		65	36.000	65	0.35860	600	0.785
		70	39.360	70	0.38840		

# ISOBUTYRONITRILE

IBN

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless	Almond-like
IBN Isopropyl cyanide 2-Methylpropanenitrile 2-Methylpropionitrile	Floats on water. Flammable vapor is produced.		
<b>Evacuate.</b> <b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.			
Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Combat fires from safe distance or protected location. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
Exposure	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>CHCN  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2284  
2.5 CAS Registry No.: 78-82-0  
2.6 NAERG Guide No.: 131  
2.7 Standard Industrial Trade Classification: 51484

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; goggles; rubber gloves
- 3.2 **Symptoms Following Exposure:** Inhalation, ingestion, or skin contact causes weakness, headache, confusion, nausea, vomiting; acute cyanide poisoning may result. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** Get medical attention following all overexposures to this chemical. Watch for symptoms of cyanide poisoning. INHALATION: move patient to fresh air; apply artificial respiration if breathing stops. INGESTION: break an amyl nitrite pearl in a cloth and hold lightly under patient's nose for 15 sec.; if conscious, induce vomiting and repeat until vomit is clear; repeat inhalation of amyl nitrite 5 times at 15-sec. intervals. EYES: flush with water for at least 15 min. SKIN: flush with water; remove contaminated clothing; destroy contaminated shoes.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 100 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 47°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 32.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; Pure
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 69.1
- 9.3 **Boiling Point at 1 atm:** 219°F = 104°C = 377°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.774 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 24.9 dynes/cm = 0.0249 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 2.4
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** 200 Btu/lb = 110 cal/g = 4.7 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -14,960 Btu/lb = -8,310 cal/g = -348 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISOBUTYRONITRILE

IBN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
67	48.250		N O T  P E R T I N E N T		N O T  P E R T I N E N T	52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86	0.581 0.573 0.564 0.556 0.548 0.540 0.532 0.524 0.517 0.510 0.502 0.495 0.489 0.482 0.475 0.469 0.463 0.457

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220	1.697 1.936 2.204 2.504 2.838 3.211 3.625 4.084 4.593 5.155 5.777 6.461 7.214 8.041 8.948 9.941 11.030 12.210 13.500 14.910	125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220	0.01868 0.02114 0.02386 0.02688 0.03021 0.03390 0.03796 0.04242 0.04733 0.05270 0.05859 0.06502 0.07203 0.07967 0.08798 0.09700 0.10680 0.11740 0.12890 0.14120		N O T  P E R T I N E N T

# ISOBUTYRIC ACID

IBR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dimethylacetic acid Isopropylformic acid 2-Methylpropanoic acid alpha-Methylpropionic acid Propane-2-carboxylic acid	Liquid  Colorless  Unpleasant, acid odor  Floats and mixes with water.
Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 4; Organic acid  
2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>CHCOOH  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2529  
2.5 CAS Registry No.: 79-31-2  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic chemical respirator; goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min.; get medical attention if irritation persists. SKIN: flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 280 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 170°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 935°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 2.6 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 23.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Corrosive to aluminum and other metals. Flammable hydrogen gas may accumulate in enclosed spaces.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 88  
9.3 **Boiling Point at 1 atm:** 309°F = 154°C = 427°K  
9.4 **Freezing Point:** -51°F = -46°C = 227°K  
9.5 **Critical Temperature:** 636.8°F = 336°C = 609.2°K  
9.6 **Critical Pressure:** 588 psia = 40 atm = 4.06 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.949 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 25.1 dynes/cm = 0.0251 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.0  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 202 Btu/lb = 112 cal/g = 4.68 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -10,600 Btu/lb = -5,880 cal/g = -246 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -20.5 Btu/lb = -11.4 cal/g = -0.477 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISOBUTYRIC ACID

IBR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-45	63.190	52	0.450	42	0.984	35	1.825
-40	63.000	54	0.450	44	0.984	40	1.735
-35	62.820	56	0.450	46	0.984	45	1.651
-30	62.630	58	0.450	48	0.984	50	1.572
-25	62.450	60	0.450	50	0.984	55	1.499
-20	62.270	62	0.450	52	0.984	60	1.430
-15	62.090	64	0.450	54	0.984	65	1.366
-10	61.910	66	0.450	56	0.984	70	1.306
-5	61.730	68	0.450	58	0.984	75	1.249
0	61.550	70	0.450	60	0.984	80	1.196
5	61.370	72	0.450	62	0.984	85	1.146
10	61.200	74	0.450	64	0.984	90	1.099
15	61.020	76	0.450	66	0.984	95	1.055
20	60.850	78	0.450	68	0.984	100	1.013
25	60.680	80	0.450	70	0.984	105	0.974
30	60.510	82	0.450	72	0.984	110	0.937
35	60.330	84	0.450	74	0.984	115	0.901
40	60.170	86	0.450	76	0.984	120	0.868
45	60.000			78	0.984		
50	59.830			80	0.984		
55	59.660			82	0.984		
60	59.500			84	0.984		
65	59.330			86	0.984		
				88	0.984		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	20.000	35	0.004	35	0.00006		N
		40	0.005	40	0.00008		O
		45	0.006	45	0.00010		T
		50	0.008	50	0.00013		
		55	0.010	55	0.00016		P
		60	0.013	60	0.00020		E
		65	0.016	65	0.00025		R
		70	0.020	70	0.00031		T
		75	0.025	75	0.00038		I
		80	0.031	80	0.00047		N
		85	0.038	85	0.00057		E
		90	0.046	90	0.00069		N
		95	0.057	95	0.00084		T
		100	0.069	100	0.00101		
		105	0.083	105	0.00121		
		110	0.100	110	0.00144		
		115	0.120	115	0.00171		
		120	0.143	120	0.00203		
		125	0.171	125	0.00240		
		130	0.203	130	0.00282		
		135	0.239	135	0.00330		
		140	0.282	140	0.00385		
		145	0.331	145	0.00448		
		150	0.387	150	0.00520		
		155	0.451	155	0.00602		
		160	0.524	160	0.00694		

# ISOBUTANE

IBT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Methylpropane	Liquefied compressed gas    Colorless    Odorless  Floats and boils on water. Flammable visible vapor cloud is produced.
Evacuate. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Stop flow of gas if possible. Cool exposed containers and men effecting shutoff with water. Let fire burn.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes. If inhaled, will cause dizziness, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 31; Paraffin
- 2.2 Formula:  $\text{CH}_3\text{CH}(\text{CH}_3)_2$
- 2.3 IMO/UN Designation: 2.0/1969
- 2.4 DOT ID No.: 1969
- 2.5 CAS Registry No.: 75-28-5
- 2.6 NAERG Guide No.: 115
- 2.7 Standard Industrial Trade Classification: 51114

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; safety goggles.
- 3.2 **Symptoms Following Exposure:** Central nervous system depression ranging from dizziness and incoordination to anesthesia and respiratory arrest, depending on concentration and extent of inhalation. Irregular heartbeat is rare but is a dangerous complication at anesthetic levels.
- 3.3 **Treatment of Exposure:** INHALATION: protect victim against self-injury if he is stuporous, confused, or anesthetized; apply artificial respiration if breathing has stopped; avoid administration of epinephrine or other sympathomimetic amines; prevent aspiration of vomitus by proper positioning of head; give symptomatic and supportive treatment. INGESTION OR ASPIRATION: no treatment required.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** None
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to skin because it is very volatile and evaporates quickly. Some frostbite possible.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -117°F C.C.
- 4.2 **Flammable Limits in Air:** 1.8%-8.4%
- 4.3 **Fire Extinguishing Agents:** Stop flow of gas
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 890°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 9.3 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure; technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2.1
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 58.12
- 9.3 **Boiling Point at 1 atm:** 10.8°F = -11.8°C = 261.4°K
- 9.4 **Freezing Point:** -427.5°F = -255.3°C = 17.9°K
- 9.5 **Critical Temperature:** 275.0°F = 135°C = 408.2°K
- 9.6 **Critical Pressure:** 529 psia = 36.0 atm = 3.65 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.557 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 14 dynes/cm = 0.014 N/m at -10°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at -10°C
- 9.10 **Vapor (Gas) Specific Gravity:** 2.0
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.095
- 9.12 **Latent Heat of Vaporization:** 158 Btu/lb = 87.5 cal/g = 3.66 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -19,458 Btu/lb = -10,810 cal/g = -452.59 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 18.96 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISOBUTANE

IBT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-55	39.520	0	0.527		N	-55	0.389
-50	39.330	5	0.530		O	-50	0.373
-45	39.140	10	0.534		T	-45	0.359
-40	38.950					-40	0.345
-35	38.760				P	-35	0.332
-30	38.570				E	-30	0.320
-25	38.380				R	-25	0.309
-20	38.190				T	-20	0.298
-15	38.000				I	-15	0.288
-10	37.810				N	-10	0.279
-5	37.620				E	-5	0.270
0	37.430				N	0	0.261
5	37.240				T	5	0.253
10	37.040					10	0.245

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	-35	4.793	-35	0.06110	0	0.348
	N	-30	5.488	-30	0.06915	25	0.364
	S	-25	6.261	-25	0.07799	50	0.381
	O	-20	7.119	-20	0.08767	75	0.397
	L	-15	8.068	-15	0.09823	100	0.413
	U	-10	9.113	-10	0.10970	125	0.429
	B	-5	10.260	-5	0.12220	150	0.444
	I	0	11.520	0	0.13570	175	0.460
	E	5	12.900	5	0.15030	200	0.475
		10	14.400	10	0.16600	225	0.490
		15	16.040	15	0.18290	250	0.505
		20	17.810	20	0.20110	275	0.519
		25	19.740	25	0.22050	300	0.534
		30	21.810	30	0.24120	325	0.548
		35	24.060	35	0.26330	350	0.562
		40	26.470	40	0.28680	375	0.576
		45	29.060	45	0.31180	400	0.590
		50	31.840	50	0.33830	425	0.603
		55	34.820	55	0.36630	450	0.617
		60	38.000	60	0.39590	475	0.630
		65	41.390	65	0.42710	500	0.643
		70	45.010	70	0.46000	525	0.655
		75	48.850	75	0.49470	550	0.668
						575	0.680
						600	0.693

# ISODECALDEHYDE

IDA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isodecaldehyde, mixed isomers Trimethylheptanals	Liquid	Colorless	Fruity odor
Floats on water.			
Keep people away. Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 19; Aldehyde
- 2.2 Formula:  $C_{10}H_{18}CHO$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective clothing; chemical goggles.
- 3.2 **Symptoms Following Exposure:** Low general toxicity. Liquid may irritate eyes and skin.
- 3.3 **Treatment of Exposure:** Wash eyes and skin with plenty of water for at least 15 min.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 185°F O.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 69.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 20.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: T
  - Damage to living resources: 2
  - Human Oral hazard: 1
  - Human Contact hazard: I
  - Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 156.28
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** (est.) 0.84 at 15° (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.02 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.03 psia

### NOTES



# ISODECALDEHYDE

IDA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
41	52.430	50	0.478	50	1.040	50	9.343
42	52.430	51	0.478	51	1.040	51	9.088
43	52.430	52	0.478	52	1.040	52	8.841
44	52.430	53	0.478	53	1.040	53	8.602
45	52.430	54	0.478	54	1.040	54	8.370
46	52.430	55	0.478	55	1.040	55	8.145
47	52.430	56	0.478	56	1.040	56	7.927
48	52.430	57	0.478	57	1.040	57	7.716
49	52.430	58	0.478	58	1.040	58	7.511
50	52.430	59	0.478	59	1.040	59	7.312
51	52.430	60	0.478	60	1.040	60	7.119
52	52.430	61	0.478	61	1.040	61	6.932
53	52.430	62	0.478	62	1.040	62	6.751
54	52.430	63	0.478	63	1.040	63	6.575
55	52.430	64	0.478	64	1.040	64	6.404
56	52.430	65	0.478	65	1.040	65	6.239
57	52.430	66	0.478	66	1.040	66	6.078
58	52.430	67	0.478	67	1.040	67	5.922
59	52.430	68	0.478	68	1.040	68	5.770
60	52.430	69	0.478	69	1.040	69	5.623
61	52.430	70	0.478	70	1.040	70	5.481
62	52.430	71	0.478	71	1.040	71	5.342
63	52.430	72	0.478	72	1.040	72	5.207
64	52.430	73	0.478	73	1.040	73	5.077
65	52.430	74	0.478	74	1.040	74	4.950
66	52.430	75	0.478	75	1.040	75	4.826

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E	180	0.223	180	0.00508	100	0.421	
	190	0.281	190	0.00631	120	0.431	
	200	0.352	200	0.00777	140	0.441	
	210	0.437	210	0.00951	160	0.451	
	220	0.540	220	0.01157	180	0.461	
	230	0.663	230	0.01399	200	0.470	
	240	0.809	240	0.01683	220	0.479	
	250	0.981	250	0.02013	240	0.488	
	260	1.184	260	0.02395	260	0.497	
	270	1.421	270	0.02836	280	0.506	
	280	1.698	280	0.03341	300	0.514	
	290	2.018	290	0.03920	320	0.522	
	300	2.389	300	0.04578	340	0.530	
	310	2.815	310	0.05324	360	0.538	
	320	3.303	320	0.06167	380	0.546	
	330	3.860	330	0.07116	400	0.554	
	340	4.493	340	0.08180	420	0.561	
	350	5.211	350	0.09369	440	0.568	
	360	6.021	360	0.10690	460	0.575	
	370	6.934	370	0.12170	480	0.582	
	380	7.958	380	0.13800	500	0.589	
	390	9.103	390	0.15600	520	0.595	
	400	10.380	400	0.17580	540	0.602	
	410	11.800	410	0.19760	560	0.608	
	420	13.380	420	0.22140	580	0.614	
					600	0.620	

# ISOPROPYL GLYCIDYL ETHER

IGE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Glycidyl isopropyl ether Isopropyl epoxypropyl ether	Liquid Colorless
<b>Wear full impervious protective clothing and approved respirator. Remove all ignition sources. Call fire department. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Flammable. Vapors can flow along surfaces to remote ignition source and flash back. Wear full protective clothing and self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, or alcohol foam.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash skin with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_5H_8OCH_2CHOCH_3$
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: Not listed.
- 2.5 CAS Registry No.: 4016-14-2
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear full impervious protective clothing and approved respirator. Where splashing is possible wear full face shield or chemical safety goggles.
- 3.2 **Symptoms Following Exposure:** Exposure can cause mental confusion and moderate irritation of the eyes, skin, and respiratory tract. Chronic exposure can cause dermatitis and skin sensitization.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. EYES: Flush with water for at least 15 min., lifting lids occasionally. Contact lenses should not be worn when working with this chemical. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.
- 3.4 TLV-TWA: 50 ppm.
- 3.5 TLV-STEL: 75 ppm
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Acute oral administration to mice, rats, and rabbits caused central nervous system depression. Subchronic inhalation by rats caused decreased weight gain, inflammation of the lungs, pneumonia, and respiratory distress.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available.
- 3.13 IDLH Value: 400 ppm.
- 3.14 OSHA PEL-TWA: 50 ppm.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 92°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide or alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.
- 4.5 **Special Hazards of Combustion Products:** Toxic vapors and gases, such as carbon monoxide, may be released in a fire.
- 4.6 **Behavior in Fire:** Vapors can flow along surfaces to remote ignition source and flash back.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** May cause some plastics, coatings, and rubber to deteriorate (insulators).
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Contact with strong oxidizing agents can cause fires and explosions. Contact with strong caustics may cause polymerization. Exposure to air or light may cause formation of explosive peroxides.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** May occur in contact with strong caustics.
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; 98%.
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Not listed.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 116.18
- 9.3 **Boiling Point at 1 atm:** 270°F = 137°C = 410°K
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.92
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 4.0
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISOPROPYL GLYCIDYL ETHER

IGE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	18.800	77	0.182	77	0.00367		C U R R E N T L Y  N O T  A V A I L A B L E

# ISOHEXANE

IHA

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms 2-Methylpentane		Watery liquid	Gasoline-like odor
		Floats on water. Flammable, irritating vapor is produced.	
Evacuate. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.			
Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
Exposure	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 31; Paraffin  
 2.2 Formula: CH<sub>3</sub>CH(CH<sub>3</sub>)CH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>  
 2.3 IMO/UN Designation: 3.1/1208  
 2.4 DOT ID No.: 1208  
 2.5 CAS Registry No.: 107-83-5  
 2.6 NAERG Guide No.: 128  
 2.7 Standard Industrial Trade Classification: 51114

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Eye protection (as for gasoline).  
 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory tract, cough, mild depression, cardiac arrhythmias. Aspiration causes severe lung irritation, coughing, pulmonary edema; excitement followed by depression. Ingestion causes nausea, vomiting, swelling of abdomen, headache, depression.  
 3.3 **Treatment of Exposure:** INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest; give oxygen. INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with copious amount of water. SKIN: wipe off, wash with soap and water.  
 3.4 TLV-TWA: 500 ppm.  
 3.5 TLV-STEL: 1,000 ppm.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** -20°F C.C.  
 4.2 **Flammable Limits in Air:** 1.2%-7.7%  
 4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 585°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 8.2 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 45.2 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 3  
 Human Oral hazard: (0)  
 Human Contact hazard: 0  
 Reduction of amenities: 0

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Research: 99.95%; pure: 99.0%; technical: 95.0%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
 7.5 **IMO Pollution Category:** C  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 86.18  
 9.3 **Boiling Point at 1 atm:** 140.5°F = 60.3°C = 333.5°K  
 9.4 **Freezing Point:** -244.6°F = -153.7°C = 119.5°K  
 9.5 **Critical Temperature:** 435.7°F = 224.3°C = 497.5°K  
 9.6 **Critical Pressure:** 437 psia = 29.7 atm = 3.01 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.653 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 17.38 dynes/cm = 0.01738 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** 2.9  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.062  
 9.12 **Latent Heat of Vaporization:** 139 Btu/lb = 77.1 cal/g = 3.23 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -19,147 Btu/lb = -10,637 cal/g = -445.35 X 10<sup>6</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** 17.41 cal/g  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 6.0 psia

### NOTES

# ISOHEXANE

IHA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-30	44.160	0	0.502	64	0.783	-30	0.455
-20	43.810	10	0.506	66	0.780	-20	0.429
-10	43.470	20	0.511	68	0.778	-10	0.406
0	43.120	30	0.515	70	0.776	0	0.385
10	42.770	40	0.519	72	0.773	10	0.366
20	42.430	50	0.524	74	0.771	20	0.349
30	42.080	60	0.528	76	0.768	30	0.333
40	41.730	70	0.533	78	0.766	40	0.319
50	41.390	80	0.537	80	0.764	50	0.305
60	41.040	90	0.542	82	0.761	60	0.293
70	40.690	100	0.546	84	0.759	70	0.282
80	40.350	110	0.551	86	0.756	80	0.271
90	40.000	120	0.555	88	0.754	90	0.261
100	39.650	130	0.559	90	0.752	100	0.252
110	39.310	140	0.564	92	0.749	110	0.244
120	38.960			94	0.747	120	0.236
130	38.610			96	0.744	130	0.228
140	38.270			98	0.742	140	0.222
				100	0.740		
				102	0.737		
				104	0.735		
				106	0.732		
				108	0.730		
				110	0.728		
				112	0.725		
				114	0.723		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	0	0.487	0	0.00851	0	0.351
	N	10	0.674	10	0.01153	25	0.367
	S	20	0.918	20	0.01536	50	0.383
	O	30	1.230	30	0.02017	75	0.399
	L	40	1.626	40	0.02612	100	0.414
	U	50	2.120	50	0.03340	125	0.430
	B	60	2.732	60	0.04221	150	0.445
	L	70	3.481	70	0.05276	175	0.460
	E	80	4.388	80	0.06527	200	0.475
		90	5.476	90	0.07998	225	0.489
		100	6.771	100	0.09713	250	0.504
		110	8.300	110	0.11700	275	0.518
		120	10.090	120	0.13970	300	0.532
		130	12.170	130	0.16570	325	0.546
		140	14.580	140	0.19520	350	0.559
		150	17.340	150	0.22830	375	0.573
		160	20.490	160	0.26550	400	0.586
		170	24.070	170	0.30690	425	0.599
		180	28.100	180	0.35270	450	0.612
		190	32.640	190	0.40330	475	0.625
		200	37.710	200	0.45890	500	0.638
		210	43.360	210	0.51980	525	0.650
						550	0.662
						575	0.675
						600	0.686

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## **1. INTRODUCTION**

The Chemical Hazards Response Information System (CHRIS) is designed to provide information needed for decision-making by responsible Coast Guard personnel during emergencies that occur during the water transport of hazardous chemicals. CHRIS also provides much information that can be used by the Coast Guard in its efforts to achieve better safety procedures and so prevent accidents.

CHRIS consists of a handbook or manual, a hazard assessment computer system (HACS), and technical support personnel located at Coast Guard headquarters. These components and their relations to one another are described in Section 2 of this manual.



## **2. COMPONENTS OF CHRIS**

### **2.1 HAZARDOUS CHEMICAL DATA**

This manual is the cornerstone of CHRIS. For each substance, it lists the specific chemical, physical, and biological data needed for the preparation and use of the other components of the system. The manual can also be used after the initial response action, when there is sufficient time to use more detailed information.

The Hazardous Chemical Data Manual is intended for use primarily by the On-Scene Coordinator (OSC) and by Regional Response Teams for devising, evaluating, and carrying out response plans.

### **2.2 HAZARD ASSESSMENT COMPUTER SYSTEM**

The Hazard Assessment Computer System (HACS) permits trained specialists to obtain very detailed hazard evaluations quickly, when requested by OSC personnel, and can be accessed through the National Response Center.

### 3. EXPLANATION OF TERMS

This section explains the special terms used in the data sheets, gives the sources of specific items, and includes other information that will be useful to the reader in interpreting the data. The paragraphs below are keyed to the relevant portions by the subheading and number used in the data sheets.

The expression “**Not pertinent**” means that the data item either has no real meaning (such as the flash point of a nonflammable chemical) or is not required for assessing a hazardous situation. The expression “**Currently not available**” means that the information sought was not found in the general or specialized data sources listed in Section 10 of this manual. In a few cases where important data were not available, values were estimated by usually reliable procedures; all such values are labeled “(est.)”. If more accurate values for those items are found, they will be included in later revisions.

The **name** used for each of the chemicals included in the CHRIS manuals is either (1) that specified in the Code of Federal Regulations, Title 46, Part 151 or (2) a common name for those chemicals not now regulated by Sub chapters O and D but known to be hazardous during shipment. The data sheets are arranged in alphabetic order by chemical name, not by the 3-letter code.

The **3-letter code** is designed to facilitate correct identification of chemicals in oral or written communication. The code should be used only *in addition* to the compound name; it should not be used alone. For transmitting the code, use the phonetic alphabet given in the “International Code of Signals.”

#### 1. RESPONSE TO DISCHARGE

In every case of a discharge or leak, it is obvious that an effort should be made to reduce, stop, or contain the flow of material at its source if this can be done safely. The purpose of the terms used in this section is to describe in a general way the cautionary and corrective responses that are described in greater detail in the Response Methods Handbook.

- “*Issue warning*” is used when the chemical is a *poison*, has a *high flammability*, is a *water contaminant*, is an *air* contaminant (so as to be hazardous to life), is an *oxidizing* material, or is *corrosive*.
- “*Restrict access*” is used only for those chemicals that are unusually and immediately hazardous to personnel unless they are protected properly by respirators, protective clothing, etc.
- “*Evacuate area*” is used primarily for unusually poisonous chemicals or those that ignite easily.
- “*Mechanical containment*” is used for water-insoluble chemicals that float and do not evaporate readily.

- “*Should be removed*” is used for chemicals that cannot be allowed to disperse because of their harmful effect on humans or on the ecological system in general. The term is not used unless there is a reasonable chance of preventing dispersal, after a discharge or leak, by chemical and physical treatment.
- “*Chemical and physical treatment*” is recommended for chemicals that can be removed by skimming, pumping, dredging, burning, neutralization, absorption, coagulation, or precipitation. The corrective response may also include the use of dispersing agents, sinking agents, and biological treatment.
- “*Disperse and flush*” is used for chemicals that can be made non-hazardous to humans by simple dilution with water. In a few cases the response is indicated even when the compound reacts with water because, when proper care is taken, dilution is still the most effective way of removing the primary hazard.

## 2. CHEMICAL DESIGNATIONS

**2.1 Coast Guard Compatibility Classification** - An entry is made when the chemical has been assigned to one of the 43 cargo groups listed in Code of Federal Regulations, Title 46, Part 150, “Compatibility of Cargoes.” Appropriate parts of these regulations are included in this manual. Chemicals included in the regulation were assigned to a group by the Cargo and Hazardous Materials Standards Division, Coast Guard Headquarters. If the chemical is not a liquid carried in bulk in ships' tanks, this data item is “Not listed.”

**2.2 Chemical Formula** - This has been limited to a commonly used one-line formula. In the case of some organic compounds it has not been possible to represent chemical structure within such a limitation.

**2.3 IMO/United Nations Numerical Designation** - The designation is that of the “International Maritime Dangerous Goods Code” published by the International Maritime Organization (IMO), London, 1977.

**2.4 Department of Transportation Identification Number** - This is an identification number assigned by the Department of Transportation to aid in categorizing hazards and recommended responses. The ID's can be located in the Hazardous Materials Table, part 172.101 of 49 CFR.

**2.5 Chemical Abstracts Services Registry Number** - The unique identification number assigned each compound registered with the Chemical Abstracts Service (CAS) is listed to aid in quick identification of the compound.

**2.6 NAERG Guide Number** – The number of the guide in the North American Emergency Response Guidebook listing specific emergency response actions for a particular CHRIS chemical. The 1996 edition of the guidebook was used in the preparation of this edition of the CHRIS manual.

**2.7 Standard Industrial Trade Classification** – The five digit code identifying the chemical's commodity category per revision 3 of the subject classification. These codes are compatible with the International Harmonized System codes used in foreign trade.

### 3. HEALTH HAZARDS

**3.1 Personal Protective Equipment** - The items listed are those recommended by (a) manufacturers, either in technical bulletins or in Material Safety Data Sheets, (b) the Chemical Manufacturers Association, or (c) the National Safety Council, for use by personnel while responding to fire or accidental discharge of the chemical. They are intended to protect the lungs, eyes, and skin. Safety showers and eyewash fountains are considered to be important protective equipment for the handling of almost all chemicals; they are not usually listed.

**3.2 Symptoms Following Exposure** - These are brief descriptions of the effects observed in humans when the vapor (gas) is inhaled, when the liquid or solid is ingested (swallowed), and when the liquid or solid comes in contact with the eyes or skin.

**3.3 Treatment for Exposure** - "First-aid" procedures are recommended. They deal with exposure to the vapor (gas), liquid, or solid and include inhalation, ingestion (swallowing) and contact with eyes or skin. The instruction "Do NOT induce vomiting" is given if an unusual hazard is associated with the chemical being sucked into the lungs (aspiration) while the patient is vomiting. "Seek medical attention" or "Call a doctor" is recommended in those cases where only competent medical personnel can treat the injury properly. In all cases of human exposure, seek medical assistance as soon as possible.

**3.4 Threshold Limit Value – Time Weighted Average** -The Threshold Limit Value Time Weighted Average (TLV-TWA) is usually expressed in units of parts per million (ppm) - i.e., the parts of vapor (gas) per million parts of contaminated air by volume at 25°C (77°F) and one atmosphere pressure. For a chemical that forms a fine mist or dust, the concentration is given in milligrams per cubic meter (mg/m<sup>3</sup>). The TLV is defined as the concentration of the substance in air that can be breathed for five consecutive eight-hour workdays (40-hour work week) by most people without adverse effect (American Conference of Governmental Industrial Hygienists, "Threshold Limit Values for Substance in Workroom Air, Adopted by ACGIH"). As some people become ill after exposure to concentrations lower than the TLV, this value cannot be used to define exactly what is a "safe" or "dangerous" concentration.

No entry appears when the chemical is a mixture; it is possible to calculate the TLV for a mixture only when the TLV for each component of the mixture is known and the composition of the mixture by weight is also known.

**3.5 Threshold Limit Value - Short-Term Exposure Limits** - The parts of vapor (gas per million parts of contaminated air by volume at 25°C (77°F) and one atmosphere pressure is given. The limits are given in milligrams per cubic meter

for chemicals that can form a fine mist or dust. The values given are the maximum permissible average exposures for the time periods specified.

**3.6 Threshold Limit Value – Ceiling Value** – The parts of vapor (gas per million parts of contaminated air by volume at 25°C (77°F) and one atmosphere pressure is given. The limits are given in milligrams per cubic meter for chemicals that can form a fine mist or dust. The values given are for a concentration that is not to be exceeded at any time.

**3.7 Toxicity by Ingestion** - The Grade and corresponding LD<sub>50</sub> value are those defined by the National Academy of Sciences, Committee on Hazardous Materials, "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide," Washington, D.C., 1972. Data were also collected from other sources and converted to the appropriate Grade before entry in this manual. The term LD<sub>50</sub> signifies that about 50% of the animals given the specified dose by mouth will die. Thus, for a Grade 4 chemical (below 50 mg/kg) the toxic dose for 50% of animals weighing 70 kg (150 lb) is 70 X 50 = 3500 mg = 3.5 g, or less than 1 teaspoonful; it might be as little as a few drops. For a Grade 1 chemical (5 to 15g/kg), the LD<sub>50</sub> would be between a pint and a quart for a 150-lb man. All LD<sub>50</sub> values have been obtained using small laboratory animals such as rodents, cats, and dogs. The substantial risks taken in using these values for estimating human toxicity are the same as those taken when new drugs are administered to humans for the first time.

**3.8 Toxicity by Inhalation** – Similar to the Toxicity by Ingestion entry, except that the route of exposure is inhalation instead of ingestion. Units and definition of units are the same.

**3.9 Chronic Toxicity** - Where there is evidence that the chemical can cause cancer, mutagenic effects, teratogenic effects, or a delayed injury to vital organs such as the liver or kidney, a qualitative description of the effect is given.

**3.10 Vapor (Gas) Irritant Characteristics** - The most appropriate of five statements listed below is given. Source: National Academy of Sciences, Committee on Hazardous Materials, "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide," Washington, D.C., 1972.)

- (1) Vapors are nonirritating to eyes and throat.
- (2) Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- (3) Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- (4) Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- (5) Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

**3.11 Liquid or Solid Irritant Characteristics** - The most appropriate of the following five statements is given (same source as 5.8 above):

- (1) No appreciable hazard. Practically harmless to the skin.
- (2) Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- (3) Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- (4) Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.
- (5) Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.

**3.12 Odor Threshold** - This is the lowest concentration in air that most humans can detect by smell. The value cannot be relied on to prevent over-exposure, because human sensitivity to odors varies over wide limits, some chemicals cannot be smelled at toxic concentrations, odors can be masked by other odors, and some compounds rapidly deaden the sense of smell.

**3.13 IDLH Value** - The Immediately Dangerous to Life and Health Value - This concentration represents a maximum level from which one could escape within 30 minutes without any escape-impairing symptoms or any irreversible health effects. The concentrations are reported in either parts per million (ppm) or milligrams per cubic meter ( $\text{mg}/\text{m}^3$ ).

**3.14 OSHA Permissible Exposure Limit – Time Weighted Average** – Similar to the definition of the TLV-TWA above, except that this limit has been promulgated by the Occupational Safety and Health Agency.

**3.15 OSHA Permissible Exposure Limit – Short Term Exposure Limit** – Similar to the definition of the TVL-STEL above, except that this limit has been promulgated by the Occupational Safety and Health Agency.

**3.16 OSHA Permissible Exposure Limit – Ceiling** – Similar to the definition of the TVL-Ceiling above, except that this limit has been promulgated by the Occupational Safety and Health Agency.

**3.17 EPA AEGL** – Acute Exposure Guideline information from the Environmental Protection Agency for the specific compound listed in the manual.

## 4. FIRE HAZARDS

**4.1 Flash Point** - This is defined as the lowest temperature at which vapors above a volatile combustible substance will ignite in air when exposed to a flame. Depending on the test method used, the values given are either Tag closed cup (C.C.) (ASTM D56) or Cleveland open cup (O.C.) (ASTM D93). The values, along with those in 6.2 and 6.7 below, give an indication of the relative flammability of the chemical. In general, the open cup value is about 10° to 15°F higher than the closed cup value.

**4.2 Flammable Limits in Air** - The percent concentration in air (by volume) is given for the lower (LFL) and upper (UFL) limit. The values, along with those in 6.1 and 6.7, give an indication of the relative flammability of the chemical. The limits are sometimes referred to as “lower explosive limit” (LEL) and “upper explosive limit” (UEL).

**4.3 Fire Extinguishing Agents** - The agents are listed in decreasing order of importance. The general capabilities of all agents are described in section 6, “Fire Protection Handbook,” 18th ed., National Fire Protection Association, Boston, Mass., 1997.

**4.4 Fire Extinguishing Agents Not to be Used** - The agents listed must not be used because they react with the chemical and create an additional hazard. In some cases they are listed because they are ineffective in putting out the fire.

**4.5 Special Hazards of Combustion Products** - Some chemicals decompose or burn to give off toxic and irritating gases. Such gases may also be given off by chemicals that vaporize in the heat of a fire without either decomposing or burning. If no entry appears, the combustion products are thought to be similar to those formed by the burning of oil, gasoline, or alcohol; they include carbon monoxide (poisonous), carbon dioxide, and water vapor. The specific combustion products are usually not well known over the wide variety of conditions existing in fires; some may be hazardous.

**4.6 Behavior in Fire** - Any characteristic behavior that might increase significantly the hazard involved in a fire is described. The formation of dense smoke or flammable vapor clouds, and the possibility of polymerization and explosions is stated. Unusual difficulty in extinguishing the fire is also noted.

**4.7 Ignition Temperature** - This is the minimum temperature at which the material will ignite without a spark or flame being present. Along with the values in 6.1 and 6.2 above, it gives an indication of the relative flammability of the chemical. It is sometimes called the “autoignition temperature.” The method of measurement is given in ASTM D-2155.

**4.8 Electrical Hazard** - The ease with which the chemical is ignited by electrical equipment is indicated by the Group and Class assignment made in the National Fire Protection Association, “Hazardous Chemicals Data,” Boston, Mass., 1994 and in “Classification of Gases, Liquids, and Volatile Solids

Relative to Explosion-Proof Electrical Equipment,” National Academy of Sciences, 1982. This information is available for relatively few chemicals, so an absence of data does not necessarily mean that the substance is not hazardous in the presence of electrical equipment.

**4.9 Burning Rate** - The value is the rate (in millimeters per minute) at which the depth of a pool of liquid decreases as the liquid burns. Details of measurement are given by D.S. Burgess, A. Strasser, and J. Grumer, “Diffusive Burning of Liquid Fuels in Open Trays,” Fire Research Abstracts and Reviews, 3, 177 (1961).

**4.10 Adiabatic Flame Temperature** - The value is the temperature in degrees Fahrenheit of the flame when the material is burned under adiabatic conditions.

**4.11 Stoichiometric Air to Fuel Ratio** - The value is the ratio of air to the compound in question required for stoichiometric combustion. Since it is a ratio, the value is dimensionless.

**4.12 Flame Temperature** - The value is the temperature in degrees Fahrenheit of the flame produced by burning the compound under stoichiometric conditions without any rate controls.

**4.13 Molar Ratio (Reactant to Product)** – The number of moles of products formed, assuming complete combustion of a single mole of the chemical reactant. These ratios were calculated assuming there was sufficient oxygen available and that combustion did, in fact, go to completion.

**4.14 Minimum Oxygen Concentration for Combustion (MOCC)** – Information from NFPA-69 regarding the minimum percentage of oxygen required to support combustion of the subject compound. The results are reported for oxygen diluted with nitrogen (N<sub>2</sub>) and/or carbon dioxide (CO<sub>2</sub>).

## 5. CHEMICAL REACTIVITY

**5.1 Reactivity with Water** - The term “No reaction” means that no hazard results when the chemical reacts or mixes with water. Where a hazard does result, it is described.

**5.2 Reactivity with Common Materials** - This is limited to hazardous reactions with fuels and with common materials of construction such as metal, wood, plastics, cement, and glass. The nature of the hazard, such as severe corrosion or formation of a flammable gas, is described.

**5.3 Stability During Transport** - The term “Stable” means that the chemical will not decompose in a hazardous manner under the conditions of temperature, pressure, and mechanical shock that are normally encountered during shipment; the term does not apply to fire situations. Where there is a possibility of hazardous decomposition, an indication of the conditions and the nature of the hazard is given.



**5.4 Neutralizing Agents for Acids and Caustics** - In all cases involving accidental discharge, dilution with water may be followed by use of the agent specified, particularly if the material cannot be flushed away; the agent specified need not necessarily be used.

**5.5 Polymerization** - A few chemicals can undergo rapid polymerization to form sticky, resinous materials, with the liberation of much heat. The containers may explode. For these chemicals the conditions under which the reaction can occur are given. See Section 12.16 for quantitative data.

**5.6 Inhibitor of Polymerization** - The chemical names and concentrations of inhibitors added by the manufacturer to prevent polymerization are given.

## 6. WATER POLLUTION

**6.1 Aquatic Toxicity** - The form of data presentation used by the Environmental Protection Agency's "Oil and Hazardous Material-Technical Assistance Data System (OHM-TADS)" is used here. Reading from left to right and separated by slashes (/) are the following data:

Concentration in parts per million by weight (or milligrams per liter)  
at which the chemical was tested;  
Time of exposure in hours;  
Name of the aquatic species studied;  
Effect observed;  $LC_{50}$  means that approximately 50% of the fish will die under the conditions of concentrations and time given.  $TL_m$  (Median Tolerance Limit) means that approximately 50% of the fish will show abnormal behavior (including death) under the conditions of concentrations and time given; the term  $EC_{50}$  (Effective Concentration<sub>50</sub>) is used sometimes instead of  $TL_m$ ;  
The kind of water used in the test (fresh or salt)

Some chemicals have been tested with many species of fish. Where the data were available, the data sheet cites one illustrative test in fresh water and one in salt water.

**6.2 Waterfowl Toxicity** - Very little information is available. In a few cases there is entered the  $LD_{50}$  value, which indicates the dose (in milligrams per kilogram of body weight) that is lethal to about half the waterfowl tested.

**6.3 Biological Oxygen Demand (BOD)** - Also called "biochemical oxygen demand," this is a standard way of describing how much oxygen dissolved in water is consumed by biological oxidation of the chemical during the stated period of time. The unit lb/lb indicates the pounds of oxygen consumed by each pound of chemical during the time stated. When given in percent, the values indicate the pounds of oxygen consumed by each 100 pounds of chemical during the time stated. If the percentage is followed by "(theor.)", it indicates the

pounds of oxygen theoretically required to completely oxidize 100 pounds of the chemical.

**6.4 Food Chain Concentration Potential** - If the chemical is consumed by fish, marine plants, waterfowl, etc., that are in turn eaten by other species, the substance may accumulate and ultimately be consumed by humans. Where this occurs, an indication of the potential hazard and its significance is given.

**6.5 GESAMP Hazard Profile** – A composite list of hazard profiles evaluated by the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP). A summary of the legends used in the profile follows.

**Bioaccumulation and Tainting**

+	Bioaccumulated to significant extent and known to produce a hazard to aquatic life or human health.
Z	Bioaccumulated with attendant risk to aquatic organisms or human health, however, with short retention of the order of one week or less.
T	Liable to produce tainting of seafood.
O	No evidence to support one of the above ratings (+, Z, T)

**Damage to Living Resources**

**96 hr LC<sub>50</sub>**

5	Extremely toxic	less than 0.01 mg/l
4	Highly toxic	less than 1 mg/l
3	Moderately toxic	1-10 mg/l
2	Slightly toxic	10-100 mg/l
1	Practically nontoxic	100-1000 mg/l
0	Non-hazardous	greater than 1000 mg/l
D	Substance likely to blanket the sea-bed	
BOD	Substance with oxygen demand	

**Hazard to Human Health by Oral Intake**

**LD<sub>50</sub>**

4	Highly hazardous	less than 5 mg/kg
3	Moderately hazardous	5-50 mg/kg
2	Slightly hazardous	50-500 mg/kg
1	Practically non-hazardous	500-5000 mg/kg
0	Non-hazardous	greater than 5000 mg/kg

**Hazard to Human Health by Skin and Eye Contact or Inhalation**

II	Hazardous (severe irritation, strong sensitizer, lung injury, percutaneous toxicity, carcinogenic, or other specific long-term
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adverse health effect.

- I Slightly hazardous (mild irritation, weak sensitizer)
- 0 Non-hazardous (non-irritant, not a sensitizer)

#### **Reduction of Amenities**

- XXX Highly objectionable because of persistency, smell or poisonous or irritant characteristics; as a result contaminated beaches liable to be closed; also used when there is clear evidence that the substance is a human carcinogen or that the substance has the potential to produce other serious specific long-term adverse health effects in humans.
- XX Moderately objectionable because of the above characteristics, but short-term effects leading only to temporary interference with use of beaches; also used when there is credible scientific evidence that the substance is an animal carcinogen but where there is no clear evidence to indicate that the material has caused cancer in humans, or when there is evidence from laboratory studies that the substance could have the potential to produce other serious specific long-term adverse health effects.
- X Slightly objectionable, non-interference with use of beaches.
- 0 No problem.

Ratings in brackets, ( ), indicate insufficient data available to the GESAMP experts on specific substances, hence extrapolation was required.

N – Not applicable (e.g. if gases)

— Indicates data were not available to the GESAMP Working Group.

## **7. SHIPPING INFORMATION**

**7.1 Grades or Purity** - The grades USP (United States Pharmacopoeia) and CP (chemically pure) are quite pure. Where “Technical” or “Commercial” grades are given, the percent by weight of the pure chemical present is usually indicated. In a few cases the identity of the major impurities is given. If the properties of the less pure grades differ significantly from those of the pure substance, the differences in properties are described in general terms.

**7.2 Storage Temperature** - The range of temperatures at which the chemical is normally shipped in bulk by water transport is given. “Ambient” means the temperature of the surroundings.

**7.3 Inert Atmosphere** - The terms used are “inerted,” “padded,” “ventilated (forced),” “ventilated (natural),” and “no requirement.” They are given when found in the Code of Federal Regulations, Title 46, beginning in Part 151.05.

**7.4 Venting** - The terms used are “open,” “pressure-vacuum,” and “safety relief” (same source as 9.3 above).

**7.5 IMO Pollution Category** – pollution classification applied to this compound by the International Maritime Organization.

**7.6 Ship Type** – The data entry refers to construction and containment requirements for ships being used to transport the chemical in question. The information is taken from the Code of Federal Regulations, Title 46, Part 154.

**7.7 Barge Hull Type** – The data entry refers to structural requirements for barge hulls being used to transport the chemical in question. The information is taken from the Code of Federal Regulations, Title 46, part 151.

## **8. HAZARD CLASSIFICATIONS**

**8.1 49 CFR Category** - This is the hazard category specified in the Hazardous Materials Table, Part 172.101, Title 49 of the Code of Federal Regulations. The October 1, 1996 edition was used to prepare this version of the CHRIS.

**8.2 49 CFR Class** – The hazard class as specified in the Hazardous Materials Table, Title 49, Part 172.101 of the Code of Federal Regulations. The October 1, 1996 edition was used to prepare this version of the CHRIS.

**8.3 49 CFR Package Group** – The packaging group assigned to this chemical in the Hazardous Materials Table, Title 49, Part 172.101 of the Code of Federal Regulations. The October 1, 1996 edition was used to prepare this version of the CHRIS. Note that the packaging group is often dependent upon toxicity or flash point of the chemical. In those cases the reported packaging group is based upon the data value reported in CHRIS for that specific compound. The packaging group could be different if the purity of the material varies from that reported in CHRIS.

**8.4 Marine Pollutant** – This is a “Yes” or “No” entry, depending upon whether the chemical is listed in “List of Marine Pollutants”, Appendix B to Part 172.101, Title 49 of the Code of Federal Regulations.

**8.5 NFPA Hazard Classifications** - The indicated ratings are given in “Fire Protection Guide on Hazardous Materials,” 7th ed., National Fire Protection Association, Boston, Mass., 1978. The classifications are defined in Table 1 below. The symbol used in conjunction with these ratings is illustrated in Section 4.2.

**8.6 EPA Reportable Quantity** – The minimum quantity, in pounds, that must be reported to EPA in the event of a spill. This value is taken from “A List of Hazardous Substances and Reportable Quantities”, Appendix A to Part 172.101, Title 49 of the Code of Federal Regulations.

**8.7 EPA Pollution Category** – An alphabetic descriptor identifying the potential pollution impact of the chemical. This descriptor is based upon the reportable quantity from category 8.6 above.

**8.8 RCRA Waste Number** – The 4 character identification number assigned to this chemical, if it is a waste, under the Resources Conservation and Recovery Act. This waste number was reported if the chemical is specifically listed.

**8.9 EPA FWPCA List** – A “Yes” or “No” entry depending upon whether the chemical is listed in the Federal Water Pollution Control Act.

**TABLE 1**  
**EXPLANATION OF NFPA HAZARD CLASSIFICATIONS**

<b>Health Hazard (blue)</b>		<b>Definition</b>
4		Materials which on very short exposure could cause death or major residual injury even though prompt medical treatment were given
3		Materials which on short exposure could cause serious temporary or residual injury even though prompt medical treatment were given.
2		Materials which on intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given.
1		Materials which on exposure would cause irritation but only minor residual injury even if no treatment is given.
0		Materials which on exposure under fire conditions would offer no hazard beyond that of ordinary combustible material.
<b>Flammability (red)</b>		
4		Materials which will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature, or which are readily dispersed in air and which will burn readily.
3		Liquids and solids that can be ignited under almost all ambient temperature conditions
2		Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.
1		Materials that must be preheated before ignition can occur.
0		Materials that will not burn.
<b>Reactivity (yellow)</b>		
4		Materials which in themselves are readily capable of detonation or explosive decomposition or reaction at normal temperatures and pressures.
3		Materials which in themselves are capable of detonation or explosive reaction but require a strong initiating source or which must be heated under confinement before initiation or which react explosively with water.
2		Materials which in themselves are normally unstable and readily undergo violent chemical change but do not detonate. Also materials which may react violently with water or which may form potentially explosive mixtures with water.
1		Materials which in themselves are normally stable, but which can become unstable at elevated temperatures and pressures or which may react with water with some release of energy but not violently.
0		Materials which in themselves are normally stable, even under fire exposure conditions, and which are not reactive with water.
<b>Other (white)</b>		
W		Materials which react so violently with water that a possible hazard results when they come in contact with water, as in a fire situation. Similar to Reactivity Classification 2.
Oxy		Oxidizing material; any solid or liquid that readily yields oxygen or other oxidizing gas, or that readily reacts to oxidize combustible materials.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**9.1 Physical State at 15°C and 1 atm** - The statement indicates whether the chemical is a solid, liquid, or gas after it has reached equilibrium with its surroundings at “ordinary” conditions of temperature and pressure.

**9.2 Molecular Weight** - The value given is the weight of a molecule of the chemical relative to a value of 12 for one atom of carbon.

The molecular weight is useful in converting from molecular units to weight units and in calculating the pressure, volume and temperature relationships for gaseous materials. The ratio of the densities of any two gases is approximately equal to the ratio of their molecular weights (see 9.10).

The molecular weights of mixtures can be calculated if both the identity and quantity of each component of the mixture are known. Because the composition of mixtures described in this manual is not known exactly, or because it varies from one shipment to another, no molecular weights are given for such mixtures.

**9.3 Boiling Point at 1 atm** - The value is the temperature of a liquid when its vapor pressure is 1 atm. For example, when water is heated to 100°C (212°F) its vapor pressure rises to 1 atm and the liquid boils.

The boiling point at 1 atm indicates whether a liquid will boil and become a gas at any particular temperature and sea-level atmospheric pressure.

**9.4 Freezing Point** - The freezing point is the temperature at which a liquid changes to a solid. For example, liquid water changes to solid ice at 0°C (32°F). Some liquids solidify very slowly even when cooled below their freezing point. When liquids are not pure (for example, salt water) their freezing points are lowered slightly.

**9.5 Critical Temperature** - The maximum temperature at which a liquid can exist, no matter what the pressure on it, is called the critical temperature. For example, the critical temperature of water is 372°C (705°F). The value can be used to estimate many properties whose values are not immediately available.

**9.6 Critical Pressure** - The vapor pressure of a chemical at the critical temperature (see 9.5) is called the critical pressure. For example, the critical pressure of water is 218 atm. Values are given in pounds per square inch absolute, atmospheres, and meganewtons per square meter. The value can be used for estimating many property values that are not immediately available.

**9.7 Specific Gravity** - The specific gravity of a chemical is the ratio of the weight of the solid or liquid to the weight of an equal volume of water at 4°C (or at some other specified temperature).

If the specific gravity is less than 1.0 (or less than 1.03 in seawater) the chemical will float; if higher, it will sink. Where the change in the value with temperature is important, more data are found in 9.20.

**9.8 Liquid Surface Tension** - This property is a measure of the tensile force at the surface of a liquid that tends to shape liquid fragments into spherical drops. Values are expressed in dynes per centimeter and newtons per meter. Liquids with high surface tensions show less tendency to spread. Water has a surface tension of about 73 dynes/cm; seawater has a slightly higher value.

**9.9 Liquid-Water Interfacial Tension** - The value is a measure of the tensile forces existing at the interface between a liquid and water. Approximately, it is the difference between the individual surface tension of the liquid and that of water. Low values of the interfacial tension indicate that the chemical spreads readily on a water surface. The units are the same as in 9.8.

**9.10 Vapor (Gas) Specific Gravity** - The value is the ratio of the weight of vapor to the weight of an equal volume of dry air at the same conditions of temperature and pressure. Buoyant vapors have a vapor specific gravity less than one. The value may be approximated by the ratio  $M/29$ , where  $M$  is the molecular weight of the chemical (see 9.2).

In some cases the vapor may be at a temperature different from that of the surrounding air. For example, the vapor from a container of boiling methane at  $-172^{\circ}\text{F}$  sinks in warm air, even though the vapor specific gravity of methane at  $60^{\circ}\text{F}$  is about 0.6.

For the effect of temperature on vapor density, see 9.26.

**9.11 Ratio of Specific Heats of Vapor (Gas)** - This property is the ratio of the specific heat at constant pressure ( $C_p$ ) to the specific heat at constant volume ( $C_v$ ); its value is always greater than one. In most cases it was calculated by use of the expression:

$$\frac{C_p}{C_v} = \frac{C_p}{(C_p - R)}$$

where  $R$  is the Universal Gas Constant.

The ratio varies slightly with temperature; the value given is at  $20^{\circ}\text{C}$  ( $68^{\circ}\text{F}$ ). The ratio is often of value in estimating temperature changes when gases are compressed or expanded. Higher values of the ratio lead to larger temperature changes for a given pressure change.

**9.12 Latent Heat of Vaporization** - The value is the heat that must be added to the specified weight of a liquid before it can change to vapor (gas). It varies with temperature; the value given is that at the boiling point at 1 atm (see 9.3). The units used are Btu per pound, calories per gram, and joules per kilogram.



No value is given for chemicals with very high boiling points at 1 atm, because such substances are considered essentially nonvolatile.

**9.13 Heat of Combustion** - The value is the amount of heat liberated when the specified weight is burned in oxygen at 25°C. The products of combustion, including water, are assumed to remain as gases; the value given is usually referred to as the “lower heat value.” The negative sign before the value indicates that heat is given off when the chemical burns. Units are the same as in 9.12.

**9.14 Heat of Decomposition** - The value is the amount of heat liberated when the specified weight decomposes to more stable substances. The value is given for very few chemicals, because most are stable and do not decompose under the conditions of temperature and pressure encountered during shipment. The negative sign before the value simply indicates that heat is given off during the decomposition. The value does not include heat given off when the chemical burns. Units are the same as in 9.12.

**9.15 Heat of Solution** - The value represents the heat liberated when the specified weight of chemical is dissolved in a relatively large amount of water at 25°C (“infinite dilution”). A negative sign before the value indicates that heat is given off, causing a rise in temperature. (A few chemicals absorb heat when they dissolve, causing the temperature to fall.) Units are the same as in 9.12.

In those few cases where the chemical reacts with water and the reaction products dissolve, the heat given off during the reaction is included in the heat of solution.

**9.16 Heat of Polymerization** - The value is the heat liberated when the specified weight of the compound (usually called the monomer) polymerizes to form the polymer. In some cases the heat liberated is so great that the temperature rises significantly, and the material may burst its container or catch fire. The negative sign before the value indicates that heat is given off during the polymerization reaction. Units are the same as in 9.12.

**9.17 Heat of Fusion** - The value is the number of Btu needed to change one pound of solid to liquid with no change in temperature.

**9.18 Limiting Value** - A chemical specific concentration in water in mole fraction units below which the contribution to the evolution of toxic or flammable vapor at the water surface can be assumed to be negligible.

**9.19 Reid Vapor Pressure** - The value is the equilibrium pressure exerted by vapor over the liquid at 100°F., expressed as pounds per square inch absolute, as defined in 46 CFR 30.10-59.

Items 9.20 through 12.27 consist of tables. The temperature is given in one column followed by the appropriate data value in the next column.

**9.20 Saturated Liquid Density** - The value is the weight (in pounds) of one cubic foot of liquid that is in equilibrium with its vapor. Liquid densities decrease slightly with an increase in temperature; where literature data or reliable estimation methods were applicable, a table shows this effect.

**9.21 Liquid Heat Capacity** - The value is the heat (in Btu) required to raise the temperature of one pound of the liquid one degree Fahrenheit at constant pressure. For example, it requires almost 1 Btu to raise the temperature of 1 pound of water from 68°F to 69°F. The value is useful in calculating the increase in temperature of a liquid when it is heated, as in a fire. The value increases slightly with an increase in temperature; the table shows this effect.

**9.22 Liquid Thermal Conductivity** - The value is a measure of the ability of a liquid to conduct heat. It represents the number of Btu per hour that pass through an area of liquid one square foot in cross-section when the temperature gradient is 1°F per inch of depth. Higher values indicate that the liquid conducts heat more readily.

Liquid thermal conductivities decrease slightly with an increase in temperature. Where applicable, the table shows this effect.

A basic law of heat conduction states that the energy flow per unit area per unit time is proportional to the gradient in temperature. The constant of proportionality is the liquid thermal conductivity.

**9.23 Liquid Viscosity** - The value (in centipoise) is a measure of the ability of a liquid to flow through a pipe or hole; higher values indicate that the liquid flows less readily under a fixed pressure head. For example, heavy oils have higher viscosities (i.e., are more viscous) than gasoline.

Liquid viscosities decrease rapidly with an increase in temperature. In some cases a table is given to show the effect. In other cases only a single data point was found in the literature.

A basic law of fluid mechanics states that, for most fluids, the force per unit area needed to shear a fluid is proportional to the velocity gradient. The constant of proportionality is the viscosity.

**9.24 Solubility in Water** - The value represents the pounds of a chemical that will dissolve in 100 pounds of pure water. Solubility usually increases when the temperature increases; where the change has been measured, a table is given to show the effect. The following terms are used when numerical data are either unavailable or not applicable:

The term "Miscible" means that the chemical mixes with water in all proportions. The term "Reacts" means that the substance reacts chemically with water; thus, its solubility has no real meaning. "Insoluble" usually means that very little of the chemical dissolves in 100 pounds of water. (Weak solutions of "Insoluble" materials may still be hazardous to humans, fish, and waterfowl, however.)

**9.25 Saturated Vapor Pressure** - The value is the pressure (in pounds per square inch absolute) of the vapor in equilibrium with the liquid form at the specified temperature. Vapor pressure values can be used to estimate the relative volatility of chemicals at a given temperature, and to calculate the pressure over a liquid that is shipped in a closed container.

The vapor pressure increases as temperature increases; a table is given to show this effect. Note that the vapor pressure scale is logarithmic.

**9.26 Saturated Vapor Density** - The value is the weight (in pounds) of one cubic foot of vapor that is in equilibrium with the liquid form.

If it is assumed that the vapor behaves as an ideal gas, the relation  $pM/RT$  holds, where  $p$  is the vapor pressure,  $M$  is the molecular weight,  $R$  is the gas constant, and  $T$  is the temperature (in absolute units).

Since the vapor pressure varies with temperature (see 9.25), the saturated vapor density also varies with temperature, as shown on the table.

**9.27 Ideal Gas Heat Capacity** - The value is the number of Btu needed to raise the temperature of one pound of gas by 1° Fahrenheit. The property can be used only when the pressure of the gas is less than about 10 atm. The ideal gas heat capacity is not a function of pressure (below about 10 atm), but it does increase with temperature, and a table is given to show the effect.

## **4. OTHER INFORMATION SYSTEMS**

### **4.1 CHEMICAL TRANSPORTATION EMERGENCY CENTER (CHEMTREC)**

The Manufacturing Chemists Association operates CHEMTREC 24 hours a day. By calling the appropriate toll-free number listed below, one can consult experts on chemicals and spill response.

Continental United States, Alaska,	
Hawaii, and Canada .....	800-424-9300
District of Columbia .....	202-483-7616

### **4.2 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)**

The NFPA's "Recommended System for the Identification of the Fire Hazards of Materials" (NFPA No. 704M) provides basic warning information to fire fighter in industrial plants and storage facilities. This system uses a diamond-shaped warning symbol. The top, left, and right boxes refer to flammability, health, and reactivity hazards respectively and contain a number from 0 to 4. The exact meaning of each number is explained in Section 3 (para 12.3) of this manual, and the applicable number for each chemical are listed in Section 11 under "NFPA Hazard Classifications." The bottom box is used for special hazards; the most common of these is a warning against the use of water, indicated by the symbol W.

### **4.3 INTERNATIONAL MARITIME ORGANIZATION (IMO)**

Foreign vessels using U.S. waterways generally utilize, in addition to U.S. requirements, an international labeling system developed by IMO. This system consists of 15 diamond-shaped labels. Each identifies a particular hazard by a descriptive picture, a word, and a distinctive color.

The number at the bottom of each diamond identifies the class to which IMO has assigned the chemical and is the same as the first digit in the IMO/UN numerical designation, one of the items given under "Chemical Designations" in Section 11 of this manual.

### **4.4 DEPARTMENT OF TRANSPORTATION (DOT)**

The "1996 North American Emergency Response Guidebook" was developed by DOT as a guide for initial actions to be taken when handling incidents involving hazardous materials. The guidebook identifies the most significant potential hazards and gives information and guidance for initial actions to be taken based upon the material involved. Information can be located in the guidebook based upon chemical name or DOT Identification Number.

#### **4.5 OHM-TADS (EPA)**

The Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) has been developed by the Environmental Protection Agency (EPA) to provide information on physical and chemical properties, hazards, pollution characteristics, and shipping information for over 1200 hazardous materials. OHM-TADS consists of a computerized data base which can be accessed from terminals at the 10 EPA Regional Offices, from EPA Headquarters in Washington, D.C., and from Coast Guard Marine Safety Offices. The System can provide either information on specifically requested properties for a material, or it can print all the information in its files for that material.

Some of the same information appears in both this manual and OHM-TADS, but each contains some information not found in the other.

#### **4.6 POISON CONTROL CENTERS**

Throughout the country, local Poison Control Centers are maintained at hospitals. These Centers can provide information on the chemical composition, appearance, and toxicity of common poisonous materials as well as information on the symptoms of exposure and on the emergency procedures recommended in the event of exposure. The information available at these centers deals mainly with common household materials.

Poison Control Centers are coordinated through the Department of Health and Human Services in Washington, D.C., but information should be requested through the local centers.

The telephone number of the local Poison Control Center can be found in a local telephone directory.

#### **4.7 ASSOCIATION OF AMERICAN RAILROADS (AAR)**

The AAR has developed emergency action guides for 134 various commodities. The guides are contained in a single binder and provide technical information as well as response guidance.

## 5. CONVERSION FACTORS

To Convert	To	Multiply by
<b>Length</b>		
inches	millimeters	25.4
inches	feet	0.0833
feet	inches	12*
feet	meters	0.3048
feet	yards	0.3333
feet	miles (U.S. statute)	0.0001894
yards	yards	3*
yards	miles (U.S. statute)	0.0005682
miles (U.S. statute)	feet	5280*
miles (U.S. statute)	yards	1760*
miles (U.S. statute)	meters	1609
miles (U.S. statute)	nautical miles	0.868
meters	feet	3.281
meters	yards	1.094
meters	miles (U.S. statute)	0.0006214
nautical miles	miles (U.S. statute)	1.152
<b>Area</b>		
square inches	square centimeters	6.452
square inches	square feet	0.006944
square feet	square inches	144*
square feet	square meters	0.09290
square meters	square feet	10.76
square miles	square yards	3,097,600*
square yards	square feet	9*
<b>Volume</b>		
cubic inches	cubic centimeters	16.39
cubic inches	cubic feet	0.0005787
cubic feet	cubic inches	1728*
cubic feet	cubic meters	0.02832
cubic feet	U.S. gallons	7.481
cubic meters	cubic feet	35.31
liters	quarts (U.S. liquid)	1.057
quarts (U.S. liquid)	liters	0.9463
U.S. gallons	barrels (petroleum)	0.02381
U.S. gallons	cubic feet	0.1337
U.S. gallons	Imperial gallons	0.8327
barrels (petroleum)	U.S. gallons	42*
Imperial gallons	U.S. gallons	1.201
milliliters	cubic centimeters	1*

\* Exact value

**Time**

seconds	minutes	0.01667
seconds	hours	0.0002778
seconds	days	0.00001157
minutes	seconds	60*
minutes	hours	0.01667
minutes	days	0.0006944
hours	seconds	3600*
hours	minutes	60*
hours	days	0.04167

**Mass or Weight**

pounds	kilograms	0.4536
pounds	short tons	0.0005*
pounds	long tons	0.0004464
pounds	metric tons	0.0004536
tons (short)	pounds	2000*
tons (metric)	pounds	2205
tons (long)	pounds	2240*
kilograms	pounds	2.205
tonnes (metric tons)	kilograms	1000*

**Energy**

calories	Btu	0.003968
calories	joules	4.187
Btu (British Thermal Units)	calories	252.0
Btu	joules	1055
joules	calories	0.2388
joules	Btu	0.0009479

**Velocity**

feet per second	meters per second	0.3048
feet per second	miles per hour	0.6818
feet per second	knots	0.5921
meters per second	feet per second	3.281
meters per second	miles per hour	2.237
miles per hour	meters per second	0.4470
miles per hour	feet per second	1.467
knots	meters per second	0.5148
knots	miles per hour	1.151
knots	feet per second	1.689

**Density**

pounds per cubic foot	grams per cubic centimeter	0.01602
grams per cubic centimeter	pounds per cubic foot	62.42
grams per cubic centimeter	kilograms per cubic meter	1000*
kilograms per cubic meter	grams per cubic centimeter	0.001*

\* Exact value

**Pressure**

pounds per square inch absolute (psia)	kilonewtons per square meter (kN/m <sup>2</sup> )	6.895
psia	atmospheres	0.0680
psia	inches of water	27.67
psia	millimeters of mercury (torr)	51.72
pounds per square inch gauge (psig)	psia	add 14.70
millimeters of mercury (torr)	psia	0.01934
millimeters of mercury (torr)	kN/m <sup>2</sup>	0.1333
inches of water	psia	0.03614
kilograms per square centimeter	millimeters of mercury (torr)	735.6
inches of water	kN/m <sup>2</sup>	0.2491
kilograms per square centimeter	atmospheres	0.9678
atmospheres	kN/m <sup>2</sup>	101.3
kilograms per square centimeter	psia	14.22
atmospheres	psia	14.70
bars	kN/m <sup>2</sup>	100*
kilonewtons per square meter	psia	0.1450
bars	atmospheres	0.9869
kilonewtons per square meter	atmospheres	0.009869
bars	kilograms per square centimeter	1.020

**Viscosity**

centipoises	pounds per foot per second	0.0006720
pounds per foot per second	centipoises	1488
centipoises	poises	0.01*
centipoises	newton seconds per square meter	0.001*
poises	grams per centimeter per second	1*
grams per centimeter per second	poises	1*
newton seconds per square meter	centipoises	1000*

**Thermal Conductivity**

Btu per hour per foot per °F	watts per meter-kelvin	1.731
Btu per hour per foot per °F	kilocalories per hour per meter per °C	1.488
watts per meter-kelvin	Btu per hour per foot per °F	0.5778
kilocalories per hour per meter per °C	watts per meter-kelvin	1.163
kilocalories per hour per meter per °C	Btu per hour per foot per °F	0.6720

**Heat Capacity**

Btu per pound per °F	calories per gram per °C	1*
Btu per pound per °F	joules per kilogram-kelvin	4187
joules per kilogram-kelvin	Btu per pound per °F	0.0002388
calories per gram per °C	Btu per pound per °F	1*

**Concentration (in water solution)**

parts per million (ppm)	milligrams per liter	1*
milligrams per liter	ppm	1*
milligrams per cubic meter	grams per cubic centimeter	1 X 10 <sup>-9</sup>
grams per cubic centimeter	milligrams per cubic meter	1 X 10 <sup>9</sup>
grams per cubic centimeter	pounds per cubic foot	62.42
pounds per cubic foot	grams per cubic centimeter	0.01602

\* Exact value



**Temperature**

degrees Kelvin ( $^{\circ}\text{K}$ )	degrees Rankine ( $^{\circ}\text{R}$ )	1.8*
degrees Rankine ( $^{\circ}\text{R}$ )	degrees Kelvin ( $^{\circ}\text{K}$ )	0.5556
degrees centigrade ( $^{\circ}\text{C}$ )	degrees Fahrenheit ( $^{\circ}\text{F}$ )	first multiply by 1.8, then add 32
degrees Fahrenheit ( $^{\circ}\text{F}$ )	degrees centigrade ( $^{\circ}\text{C}$ )	first subtract 32, then multiply by 0.5556
degrees centigrade ( $^{\circ}\text{C}$ )	degrees Kelvin ( $^{\circ}\text{K}$ )	add 273.2
degrees Fahrenheit ( $^{\circ}\text{F}$ )	degrees Rankine ( $^{\circ}\text{R}$ )	add 459.7

**Flow**

cubic feet per second	U.S. gallons per minute	448.9
U.S. gallons per minute	cubic feet per second	0.002228

**Universal Gas Constant (R)**

8.314 joules per gram mole-Kelvin  
1.987 calories per gram mole-Kelvin  
1.987 Btu per pound mole per  $^{\circ}\text{F}$   
10.73 psia-cubic feet per pound mole per  
 $^{\circ}\text{F}$   
82.057 atm-cubic centimeters per gram  
mole-Kelvin  
62.361 millimeters mercury liter per gram  
mole-Kelvin

\* Exact value

## **6. SELECTED PROPERTIES OF FRESH WATER, SEA WATER, ICE AND AIR**

The following properties are useful for engineering calculations described in the Hazard Assessment Handbook. The values for fresh water are those recorded for pure water. The values for the water of lakes and streams differ somewhat from those of pure water, but since no "standard" fresh water has ever been defined, the values for pure water must be used.

A "standard" sea water has been defined as one containing 35 grams of salts per kilogram of solution. The values for the water of tidal estuaries differ somewhat from those of "standard" sea water because the water has a salinity somewhere between those of fresh and sea waters.

The value for the density of air was derived from the ideal gas law; the air is assumed to be dry and at 1 atmosphere pressure.

### **6.1 FREEZING POINT**

Fresh Water	0°C	32°F
Sea Water	-1.91°C	28.6°F

### **6.2 LATENT HEAT OF FUSION OF ICE**

$$79.6 \text{ cal/g} = 143.3 \text{ Btu/lb}$$

### **6.3 DENSITY** (See Table 6.1)

### **6.4 VISCOSITY** (See Table 6.1)

### **6.5 HEAT CAPACITY** (See Table 6.1)

### **6.6 THERMAL CONDUCTIVITY** (See Table 6.1)

### **6.7 VAPOR PRESSURE** (See Table 6.1)

**TABLE 6.1**

DENSITY OF FRESH WATER		DENSITY OF SEA WATER		DENSITY OF ICE		DENSITY OF DRY AIR (1 atm.)	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	Pounds per cubic foot
32	62.410	30	64.250	-50	57.670	-10	0.088
40	62.418	40	64.200	-40	57.625	0	0.086
50	62.401	50	64.170	-30	57.600	10	0.085
60	62.358	60	64.100	-20	57.582	20	0.083
70	62.293	70	64.020	-10	57.541	30	0.081
80	62.208	80	63.950	0	57.105	40	0.079
90	62.105	90	63.800	10	57.490	50	0.078
100	61.986	100	63.700	20	57.455	60	0.076
110	61.852			30	57.410	70	0.075
120	61.704					80	0.074
						90	0.072
						100	0.071
						110	0.070
						120	0.068

VISCOSITY OF FRESH WATER		VISCOSITY OF SEA WATER		HEAT CAPACITY OF FRESH WATER		HEAT CAPACITY OF SEA WATER	
Temperature (degrees F)	Centipoise	Temperature (degrees F)	Centipoise	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit per pound-F
32	1.770	30	1.880	32	1.007	30	0.936
40	1.540	40	1.610	40	1.004	40	0.935
50	1.304	50	1.400	50	1.001	50	0.934
60	1.122	60	1.210	60	1.000	60	0.932
70	0.974	70	1.060	70	0.999	70	0.931
80	0.858	80	0.920	80	0.998	80	0.930
90	0.763	90	0.815	90	0.998	90	0.928
100	0.682	100	0.730	100	0.998	100	0.927
110	0.616			110	0.998		
120	0.558			120	0.998		

**TABLE 6.1 (Continued)**

HEAT CAPACITY OF ICE		THERMAL CONDUCTIVITY OF FRESH WATER		THERMAL CONDUCTIVITY OF SEA WATER		THERMAL CONDUCTIVITY OF ICE	
Temperature (degrees F)	British thermal units per pound-F	Temperature (degrees F)	British thermal unit-inch per hour square foot-F	Temperature (degrees F)	British thermal unit-inch per hour square foot-F	Temperature (degrees F)	British thermal unit-inch per hour square foot-F
-50	0.400	32	3.932	30	3.890	-50	18.754
-40	0.413	40	3.979	40	3.950	-40	18.347
-30	0.426	50	4.037	50	4.010	-30	17.939
-20	0.438	60	4.096	60	4.070	-20	17.531
-10	0.451	70	4.154	70	4.130	-10	17.123
0	0.464	80	4.212	80	4.190	0	16.715
10	0.476	90	4.271	90	4.250	10	16.308
20	0.489	100	4.329	100	4.310	20	15.900
30	0.502	110	4.387			30	15.492
		120	4.446				

SATURATED VAPOR PRESSURE OF FRESH WATER		SATURATED VAPOR PRESSURE OF SEA WATER		SATURATED VAPOR PRESSURE OF ICE	
Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per square inch
32	0.089	30	0.079	-50	0.001
40	0.122	40	0.115	-40	0.002
50	0.178	50	0.167	-30	0.003
60	0.256	60	0.242	-20	0.006
70	0.363	70	0.351	-10	0.011
80	0.507	80	0.509	0	0.019
90	0.698	90	0.700	10	0.031
100	0.950	100	0.950	20	0.051
				30	0.081

## 7. GUIDE TO COMPATIBILITY OF CHEMICALS

The Guide is based in part upon information provided to the Coast Guard by the National Academy of Sciences - U.S. Coast Guard Advisory Committee on Hazardous Materials and represents the latest information available to the Coast Guard on chemical compatibility.

The accidental mixing of one chemical cargo with another can in some cases be expected to result in a vigorous and hazardous chemical reaction. The generation of toxic gases, the heating, overflow, and rupture of cargo tanks, and fire and explosion are possible consequences of such reactions.

The purpose of the Compatibility Chart is to show chemical combinations believed to be dangerously reactive in the case of accidental mixing. It should be recognized, however, that the Chart provides a broad grouping of chemicals with an extensive variety of possible binary combinations. Although one group, generally speaking, can be considered dangerously reactive with another group where an "X" appears on the Chart, there may exist between the groups some combinations which would not dangerously react. The Chart should therefore not be used as an infallible guide. It is offered as an aid in the safe loading of bulk chemical cargoes, with the recommendation that proper safeguards be taken to avoid accidental mixing of binary mixtures for which an "X" appears on the Chart. Proper safeguards would include consideration of such factors as avoidance of the use of common cargo and vent lines and carriage in adjacent tanks having a common bulkhead.

The following procedure explains how the Guide should be used in determining compatibility information:

- (1) Determine the reactivity group of a particular product by referring to the alphabetical list in Table 7.1.
- (1) Enter the Chart with the reactivity group. Proceed across the page. An "X" indicates a reactivity group that forms an unsafe combination with the product in question.

For example, crotonaldehyde is listed in Table 7.1 as belonging in Group 19 (Aldehydes) and also has a notation, (2), which is explained in the footnotes to Table 7.1. The Compatibility Chart shows that chemicals in group 19 should be segregated from sulfuric and nitric acids, caustics, ammonia, and all types of amines (aliphatic, alkanol, and aromatic). Footnote (2), refers the user to Table 7.3 where exceptions to the Compatibility Chart are listed. Here, crotonaldehyde is listed as also being incompatible with Group 1, non-oxidizing acids.

It is recognized that there are wide variations in the reaction rates of individual chemicals within the broad groupings shown reactive by the Compatibility Chart. Some individual materials in one group will react violently with some of the materials in another group and cause great hazard; others will react slowly, or not at all. Accordingly, a useful addition to the Guide would be the identification of specific materials which might not follow the characteristic reactivities of the rest of the materials in its Group. A few such combinations are listed in Table 7.3; as other exceptions to the Chart become known, they will be listed in subsequent revisions of this manual.

# FIGURE 1 – COMPATIBILITY CHART

[X indicates incompatible groups]

## CARGO COMPATIBILITY

CARGO GROUPS	REACTIVE GROUPS	1. NON-OXIDIZING MINERAL ACIDS	2. SULFURIC ACID	3. NITRIC ACID	4. ORGANIC ACIDS	5. CAUSTICS	6. AMMONIA	7. ALIPHATIC AMINES	8. ALKANOLAMINES	9. AROMATIC AMINES	10. AMIDES	11. ORGANIC ANHYDRIDES	12. ISOCYANATES	13. VINYL ACETATE	14. ACRYLATES	15. SUBSTITUTED ALLYLS	16. ALKYLENE OXIDES	17. EPICHLOROHYDRINS	18. KETONES	19. ALDEHYDES	20. ALCOHOLS, GLYCOLS	21. PHENOLS, CRESOLS	22. CAPROLACTAM SOLUTION	
1. NON-OXIDIZING MINERAL ACIDS			X			X	X	X	X	X	X	X	X	X			X	X						1
2. SULFURIC ACID		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	2
3. NITRIC ACID			X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	3
4. ORGANIC ACIDS			X			X	X	X	X				X				X	X						4
5. CAUSTICS		X	X	X	X							X	X				X	X		X	X	X	X	5
6. AMMONIA		X	X	X	X						X	X	X	X			X	X		X				6
7. ALIPHATIC AMINES		X	X	X	X							X	X	X	X	X	X	X	X	X	X	X	X	7
8. ALKANOLAMINES		X	X	X	X							X	X	X	X	X	X	X		X				8
9. AROMATIC AMINES		X	X	X								X	X						X					9
10. AMIDES		X	X	X			X						X									X		10
11. ORGANIC ANHYDRIDES		X	X	X		X	X	X	X	X														11
12. ISOCYANATES		X	X	X	X	X	X	X	X	X	X										X		X	12
13. VINYL ACETATE		X	X	X			X	X	X															13
14. ACRYLATES			X	X				X	X															14
15. SUBSTITUTED ALLYLS			X	X				X	X															15
16. ALKYLENE OXIDES		X	X	X	X	X	X	X	X															16
17. EPICHLOROHYDRIN		X	X	X	X	X	X	X	X															17
18. KETONES			X	X				X																18
19. ALDEHYDES			X	X		X	X	X	X	X														19
20. ALCOHOLS, GLYCOLS			X	X		X		X					X											20
21. PHENOLS, CRESOLS			X	X		X		X			X													21
22. CAPROLACTAM SOLUTION			X			X		X					X											22
30. OLEFINS			X	X																				30
31. PARAFFINS																								31
32. AROMATIC HYDROCARBONS				X																				32
33. MISCELLANEOUS HYDROCARBON MIXTURES				X																				33
34. ESTERS			X	X																				34
35. VINYL HALIDES				X																		X		35
36. HALOGENATED HYDROCARBONS																								36
37. NITRILES			X																					37
38. CARBON DISULFIDE								X	X															38
39. SULFOLANE																								39
40. GLYCOL ETHERS			X										X											40
41. ETHERS			X	X																				41
42. NITROCOMPOUNDS					X	X	X	X	X	X														42
43. MISCELLANEOUS WATER SOLUTIONS			X										X											43
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Acetaldehyde	19	AAD	
Acetic acid	<sup>2</sup> 4	AAC	
Acetic anhydride	11	ACA	
Acetone	<sup>2</sup> 18	ACT	
Acetone cyanohydrin	<sup>1,2</sup> 0	ACY	
Acetonitrile	37	ATN	
Acetophenone	18	ACP	
Acrolein	<sup>2</sup> 19	ARL	
Acrylamide solution	10	AAM	
Acrylic acid	<sup>2</sup> 4	ACR	
Acrylonitrile	<sup>2</sup> 15	CAN	
Acrylonitrile-Styrene copolymer dispersion in Polyether polyol	20	ALE	
Adiponitrile	37	AND	
Alachlor technical	33	ALH	
*Alcohols (C13+)	20	ALY	TDN/TTN/PDC/TFA
Alcoholic beverages	20		
*Alcohol polyethoxylates	20		APU/APV/APW (APK/APL)
Alcohol polyethoxylates, secondary	20		AEA/AEB
Alkanes (C6-C9)	31	ALK	HXS/HMX/OAX/NAX
n-Alkanes (C10+)	31		DCC/DOC/TRD/ALJ
iso- & cyclo-Alkanes (C10-C11)	31	AKI	
iso & cyclo-Alkanes (C12+)	31		
Alkane (C14-C17) sulfonic acid, sodium salt solution	34	AKA	
Alkanyl polyether (C9-C20)	41	AKP	
Alkenyl (C11+) amide	11	AKM	
Alkenylsuccinic anhydride	11	AAH	
Alkyl acrylate-Vinyl pyridine copolymer in Toluene	32	AAP	
Alkyl (C8+) amine, Alkenyl (C12+) acid ester mixture	34	AAA	
Alkyl (C3-C4) benzenes	32	AKC	PBY/BBE
Alkyl (C5-C8) benzenes	32	AKD	
*Alkyl (C9+) benzenes	32	AKB	DBZ/UDB/DDB/TRB /TDB
*Alkylbenzene, Alkylindane, Alkylindene mixture (each C12-C17)	32	AIH	
Alkylbenzenesulfonic acid	<sup>1,2</sup> 0	ABS	
Alkylbenzenesulfonic acid, sodium salt solutions	33	ABT	
Alkyldithiadiazole (C6-C24)	33	ADT	
Alkyl ester copolymer (C6-C18)	34	AES	
Alkyl (C7-C9) nitrates	<sup>2</sup> 34	AKN	ONE
Alkyl phenol sulfide (C8-C40)	<sup>34</sup>	AKS	
Alkyl phthalates	34		
Allyl alcohol	<sup>2</sup> 15	ALA	
Allyl chloride	15	ALC	
Aluminum chloride, Hydrochloric acid solution	0	AHS	
Aluminum sulfate solution	<sup>2</sup> 43	ASX	ALM
2-(2-Aminoethoxy)ethanol	8	AEX	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Aminoethyldiethanolamine, Aminoethylethanolamine solution	8		
Aminoethylethanolamine	8	AEE	
N-Aminoethylpiperazine	7	AEP	
2-Amino-2-hydroxymethyl-1,3-propanediol solution	43	AHL	
2-Amino-2-methyl-1-propanol	8	APR	
Ammonia, anhydrous	6	AMA	
Ammonia, aqueous, see Ammonium hydroxide	6		AMH
Ammonium bisulfite solution	<sup>2</sup> 43	ABX	ASU
*Ammonium hydrogen phosphate solution	0	AMI	
Ammonium hydroxide (28% or less ammonia)	6	AMH	
Ammonium nitrate solution	<sup>1</sup> 0	ANR	AMN
Ammonium nitrate, Urea solution (containing Ammonia)	6	UAS	
*Ammonium nitrate, Urea solution (not containing Ammonia)	43	ANU	UAT
*Ammonium polyphosphate solution	43	AMO	APP
Ammonium sulfate solution	43	AME	AMS
Ammonium sulfide solution	5	ASS	ASF
Ammonium thiocyanate, Ammonium thiosulfate solution	0	ACS	
Ammonium thiosulfate solution	43	ATV	ATF
Amyl acetate	34	AEC	IAT/AML/AAS/AYA
Amyl alcohol	20	AAI	IAA/AAN/ASE/APM
*Amylene, see Pentene	30	AMZ	PTX
*Amyl methyl ketone, see Methyl amyl ketone	18	AMK	MAK
Aniline	9	ANL	
Animal and Fish oils, n.o.s.	34	AFN	
Animal and Fish acid oils and distillates, n.o.s.	34	AFA	
Anthracene oil (Coal tar fraction), see Coal tar	33	AHO	COR
Apple juice	43		
Aryl polyolefin (C11-C50)	30	AYF	
Asphalt	33	ASP	ACU
Asphalt blending stocks, roofers flux	33	ARF	
Asphalt blending stocks, straight run residue	33	ASR	
Aviation alkylates	33	AVA	GAV
Barium long chain alkaryl sulfonate (C11-C50)	34	BCA	
Barium long chain alkyl (C8-C14) phenate sulfide	34	BCH	
Behenyl alcohol	20		
Benzene	32	BNZ	
Benzene hydrocarbon mixtures (having 10% Benzene or more)	32	BHB	
Benzenesulfonyl chloride	<sup>1,2</sup> 0	BSC	
Benzene, Toluene, Xylene mixtures	32	BTX	
Benzene tricarboxylic acid, trioctyl ester	34		
Benzylacetate	34	BZE	
Benzyl alcohol	21	BAL	
Benzyl chloride	36	BCL	
Brake fluid base mixtures	20	BFX	
Butadiene	30	BDI	
Butadiene, Butylene mixtures (cont. Acetylenes)	30	BBM	
Butane	31	BMX	IBT/BUT



**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Butene, see Butylene	30		IBL/BTN
Butene oligomer	30	BOL	
Butyl acetate	34	BAX	IBA/BCN/BTA/BYA
Butyl acrylate	14	BAR	BAI/BTC
Butyl alcohol	<sup>2</sup> 20		IAL/BAN/BAS/BAT
Butylamine	7	BTY	IAM/BAM/BTL/BUA
Butylbenzene	32	BBE	
Butyl benzyl phthalate	34	BPH	
Butyl butyrate	34	BBA	BUB/BIB
Butylene	30	BTN	IBL
Butylene glycol	<sup>2</sup> 20	BUG	
Butylene oxide	16	BTO	
Butyl ether	41	BTE	
Butyl formate	34		BFI/BFN
Butyl heptyl ketone	18	BHK	
Butyl methacrylate	14	BMH	BMI/BMN
Butyl methacrylate, Decyl methacrylate, Cetyl-Eicosyl methacrylate mixture	14	DER	
Butyl phenol, Formaldehyde resin in Xylene	32		
n-Butyl propionate	34	BPN	
Butyl stearate	34		
Butyl toluene	32	BUE	
Butyraldehyde	19	BAE	BAD/BTR/BFA
Butyric acid	4	BRA	IBR
gamma-Butyrolactone	<sup>1,2</sup> 0	BLA	
Calcium alkyl (C9) phenol sulfide, polyolefin phosphorosulfide mixture	34	CPX	
Calcium bromide solution, see Drilling brines	43		DRB
Calcium bromide, Zinc bromide solution, see Drilling brine (containing zinc salts)	43		DZB
Calcium carbonate slurry	34		
Calcium chloride solution	43	CCS	CLC
Calcium hydroxide slurry	5	COH	
Calcium hypochlorite solutions	5		CHZ/CHU/CHY
Calcium long chain alkaryl sulfonate (C11-C50)	34	CAY	
Calcium long chain alkyl phenate (C8-C40)	34	CAN	
Calcium long chain alkyl phenate sulfide (C8-C40)	34	CPI	
Calcium long chain alkyl salicylate (C13+)	34	CAK	
Calcium long chain alkyl phenolic amine (C8-C40)	7		
Calcium nitrate, Magnesium nitrate, Potassium chloride solution	34		
Calcium sulfonate, Calcium carbonate, Hydrocarbon solvent mixture	33		
Camphor oil	18	CPO	
Caprolactam solution	22	CLS	
Carbolic oil	21	CBO	
Carbon disulfide	38	CBB	
Carbon tetrachloride	36	CBT	
Cashew nut shell oil (untreated)	4	OCN	
Caustic potash solution	<sup>2</sup> 5	CPS	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Caustic soda solution	<sup>25</sup>	CSS	
Cetyl-Eicosyl methacrylate mixture	14	CEM	
Cetyl-Stearyl alcohol	20		
Chlorinated paraffins (C10-C13)	36	CLH	
Chlorinated paraffins (C14 - C17)	36		
Chlorine	<sup>10</sup>	CLX	
Chloroacetic acid solution	4	CHM	CHL/MCA
Chlorobenzene	36	CRB	
Chlorodifluoromethane	36	MCF	
Chloroform	36	CRF	
Chlorohydrins	17	CHD	
4-Chloro-2-methylphenoxyacetic acid, Dimethylamine salt solution	9	CDM	
*Chloronitrobenzene	42	CNO	
Chloropropionic acid	4	CPM	CLA/CLP
Chlorosulfonic acid	<sup>10</sup>	CSA	
Chlorotoluene	36	CHI	CTM/CTO/CRN
Choline chloride solutions	20	CCO	
Citric acid	4	CIS	CIT
Clay slurry, see also Kaolin clay slurry	43		
Coal tar	33	COR	OCT
Coal tar pitch	33	CTP	
Cobalt naphthenate in solvent naphtha	34	CNS	
Coconut oil, fatty acid	34	CFA	
Corn syrup	43	CSY	
Cottonseed oil, fatty acid	34	CFY	
Creosote	<sup>21</sup>	CCT	CCW/CWD
Cresols	21	CRS	CRL/CSL/CSO
Cresylate spent caustic solution	05	CSC	
Cresylic acid	21	CRY	
Cresylic acid, dephenolized	21	CAD	
Cresylic acid, sodium salt solution, see Cresylate spent caustic	05		CSC
Cresylic acid tar	21	CRX	
Crotonaldehyde	<sup>219</sup>	CTA	
Cumene (isopropyl benzene), see Propylbenzene	32	CUM	PBY
1,5,9-Cyclododecatriene	30	CYT	
Cycloheptane	31	CYE	
Cyclohexane	31	CHX	
Cyclohexanol	20	CHN	
Cyclohexanone	18	CCH	
Cyclohexanone, cyclohexanol mixture	<sup>218</sup>	CYX	
Cyclohexyl acetate	34	CYC	
Cyclohexylamine	07	CHA	
*1,3-Cyclopentadiene dimer	30	CPD	DPT
Cyclopentane	31	CYP	
Cyclopentene	30	CPE	
Cymene	32	CMP	
Decahydronaphthalene	33	DHN	
Decaldehyde	19		IDA/DAL

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
*Decane, see n-Alkanes (C10+)	31	DCC	ALJ
Decanoic acid	04	DCO	
Decene	30	DCE	
Decyl acetate	34	DYA	
Decyl acrylate	14	DAT	IAI/DAR
Decyl alcohol	<sup>2</sup> 20	DAX	ISA/DAN
Decylbenzene	32	DBZ	AKB
Decyloxytetrahydro-thiophene dioxide	<sup>2</sup> 0	DHT	
Dextrose solution	43	DTS	
Diacetone alcohol	<sup>2</sup> 20	DAA	
Dialkyl(C10 - C14) benzenes	32	DAB	
Dialkyl(C7 - C13) phthalates	34	DAH	DHP/DIE/DOP/DIF /DTP/DUP/DID/DIN /DIO/EHE
Dibutyl amine	7	DBA	
Dibutyl hydrogen phosphonate	34	DHD	
Dibutyl phthalate	34	DPA	
Dichlorobenzene	36	DBX	DBM/DBO/DBP
Dichlorodifluoromethane	36	DCF	
1,1-Dichloroethane	36	DCH	
2,2'-Dichloroethyl ether	41	DEE	
1,6-Dichlorohexane	36	DHX	
2,2'-Dichloroisopropyl ether	36	DCI	
Dichloromethane	36	DCM	
2,4-Dichlorophenol	21	DCP	
2,4-Dichlorophenoxyacetic acid, Diethanolamine salt solution	43	DDE	
2,4-Dichlorophenoxyacetic acid, Dimethylamine salt solution	<sup>1,2</sup> 0	DAD	DDA/DSX
2,4-Dichlorophenoxyacetic acid, Triisopropanolamine salt solution	<sup>2</sup> 43	DTI	
Dichloropropane	36	DPX	DPB/DPP/DPC/DPL
1,3-Dichloropropene	15	DPS	DPU/DPF
Dichloropropene, dichloropropane mixture	15	DMX	
2,2-Dichloropropionic acid	4	DCN	
*Dicyclopentadiene, see 1,3-Cyclopentadiene dimer	30	DPT	CPD
Diethanolamine	08	DEA	
Diethanolamine salt of 2,4-Dichlorophenoxyacetic acid solution	43	DDE	
Diethylamine	07	DEN	
Diethylaminoethanol, see Diethylethanolamine	08		DAE
2,6-Diethylaniline	09	DMN	
Diethylbenzene	32	DEB	
Diethylene glycol	<sup>2</sup> 40	DEG	
Diethylene glycol butyl ether, see Poly(2-8) alkalene glycol monoalkyl (C1-C6) ether	40	DME	PAG
Diethylene glycol butyl ether acetate, see Poly(2-8) alkylene glycol monoalkyl(C1-C6)	34	DEM	PAF
Diethylene glycol dibutyl ether	40	DIG	
Diethylene glycol diethyl ether	40		

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Diethylene glycol ethyl ether, see Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether	40	DGE	PAG
*Diethylene glycol ethyl ether acetate, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether acetates	34	DGA	PAF
Diethylene glycol n-hexyl ether, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether	40	DHE	PAG
*Diethylene glycol methyl ether, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether	40	DGM	PAG
Diethylene glycol methyl ether acetate, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether acetate	34	DGR	PAF
Diethylene glycol phenyl ether	40	DGP	
Diethylene glycol phthalate	34	DGL	
Diethylene glycol propyl ether, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether	40	DGO	PAG
Diethylenetriamine	<sup>2</sup> 7	DET	
Diethylenetriamine pentaacetic acid, pentasodium salt solution	43		
Diethylethanolamine	8	DAE	
Diethyl ether, see Ethyl ether	41		EET
Di-(2-ethylhexyl)adipate	34	DEH	
Di-(2-ethylhexyl)phosphoric acid	1	DEP	
*Di-(2-ethylhexyl)phthalate, see Dialkyl (C7-C13) phthalates	34	DIE	DIO/DOP/DAH
Diethyl phthalate	34	DPH	
Diethyl sulfate	34	DSU	
Diglycidyl ether of Bisphenol A	41	BDE	BPA
Diglycidyl ether of Bisphenol F	41	DGF	
Diheptyl phthalate	34	DHP	
Di-n-hexyl adipate	34	DHA	
Dihexyl phthalate	34		
1,4Dihydro-9,10-dihydroxy anthracene, disodium salt solution	5	DDH	
Diisobutylamine	7	DBU	
*Diisobutylcarbinol, see Nonyl alcohol	20	DBC	NNS
Diisobutylene	30	DBL	
Diisobutyl ketone	18	DIK	
Diisobutyl phthalate	34	DIT	
*Diisodecyl phthalate, see Dialkyl (C7-C13) phthalates	34	DID	DAH
Diisononyl adipate	34	DNY	
*Diisononyl phthalate, see Dialkyl (C7-C13) phthalates	34	DIN	DAH
Diisooctyl phthalate	34	DIO	
Diisopropanolamine	8	DIP	
Diisopropylamine	7	DIA	
Diisopropylbenzene	32	DIX	
Diisopropyl naphthalene	32	DII	
N,N-Dimethyl acetamide	10	DAC	
N,N-Dimethylacetamide solution	10	DLS	
Dimethyl adipate	34	DLA	
Dimethylamine	7	DMA	
Dimethylamine solution	7		DMG/DMY/DMC

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Dimethylamine salt of 4-Chloro-2-methylphenoxyacetic acid solution	9	CDM	
Dimethylamine salt of 2,4-dichlorophenoxyacetic acid solution	<sup>1,2</sup> 0	DAD	DDA/DSX
2,6-Dimethylaniline	9	DMM	
Dimethylcyclcsiloxane hydrolyzate	34		
N,N-Dimethylcyclohexylamine	7	DXM	
Dimethylethanolamine	8	DMB	
Dimethylformamide	10	DMF	
Dimethyl furan	41		
Dimethyl glutarate	34	DGT	
Dimethyl hydrogen phosphite	<sup>2</sup> 34	DPI	
Dimethyl naphthalene sulfonic acid, sodium salt solution	<sup>2</sup> 34	DNS	
Dimethyloctanoic acid	4	DMO	
Dimethyl phthalate	34	DTL	
Dimethylpolysiloxane	34	DMP	
2,2-Dimethylpropane-1,3-diol	20	DDI	
Dimethyl succinate	34	DSE	
Dinitrotoluene	42	DNM	DTT/DNL/DNU
*Dinonyl phthalate, see Dialkyl (C7-C13) phthalates	34	DIF	DAH
*Diocetyl phthalate, see Dialkyl (C7-C13) phthalates	34	DOP	DAH
1,4-Dioxane	41	DOX	
Dipentene	30	DPN	
Diphenyl	32	DIL	
Diphenylamines, alkylated	7	DAJ	
Diphenylamine, reaction product with 2,2,4-trimethylpentene	7	DAK	
Diphenyl, Diphenyl ether mixture	33	DDO	DTH
Diphenyl ether	41	DPE	
Diphenyl ether, Diphenyl phenyl ether mixture	41	DOB	
Diphenylmethane diisocyanate	12	DPM	
Diphenylol propane-Epichlorohydrin resins	<sup>1</sup> 0	DPR	
Di-n-propylamine	7	DNA	
Dipropylene glycol	40	DPG	
Dipropylene glycol butyl ether, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether	40	DBG	PAG
Dipropylene glycol dibenzoate	34	DGY	
Dipropylene glycol methyl ether, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether	40	DPY	PAG
Distillates: flashed feed stocks	33	DFF	
Distillates: straight run	33	DSR	
*Ditridecyl phthalate, see Dialkyl (C7-C13) phthalates	34	DTP	DAH
*Diundecyl phthalate, see Dialkyl (C7-C13) phthalates	34	DUP	DAH
Dodecane	31	DOC	PFN
Dodecanol	20	DDN	LAL
Dodecene	30	DOZ	DDC/DOD
2-Dodecenylsuccinic acid, dipotassium salt solution	34		DSP
*Dodecyl alcohol, see Dodecanol			DDN
Dodecylamine, tetradecylamine mixture	<sup>2</sup> 07	DTA	
Dodecylbenzene	32	DDB	AKB
Dodecylbenzenesulfonic acid	<sup>2</sup> 0	DSA	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Dodecyl diphenyl oxide disulfonate solution	43	DOS	
Dodecyl hydroxypropyl sulfide	<sup>2</sup> 0	DOH	
Dodecylmethacrylate	14	DDM	
Dodecyl, pentadecyl methacrylate mixtures	14	DDP	
Dodecyl phenol	21	DOL	
Dodecyl xylene	32	DXY	
Drilling brine (containing Calcium, Potassium or Sodium salts)	43		DRB
Drilling brine (containing Zinc salts)	43	DZB	
Drilling mud (low toxicity) (if flammable or combustible)	33		DRM
Drilling mud (low toxicity) (if non-flammable or non-combustible)	43		DRM
Epichlorohydrin	17	EPC	
Epoxy resin	18		
Ethane	31	ETH	
Ethanolamine	8	MEA	
*2-Ethoxyethanol, see Ethylene glycol monoalkyl ethers	40	EEO	EGC/EGE
2-Ethoxyethyl acetate	34	EEA	
*Ethoxylated alcohols, C11-C15, see the alcohol polyethoxylates	20		APU/APV/APW (EOD/ENP/EOP/EOT/ETD)
Ethoxy triglycol	40	ETG	
Ethyl acetate	34	ETA	
Ethyl acetoacetate	34	EAA	
Ethyl acrylate	14	EAC	
Ethyl alcohol	<sup>2</sup> 0	EAL	
Ethylamine	<sup>2</sup> 7	EAM	
Ethylamine solution	7	EAN	
Ethyl amyl ketone	18	EAK	ELK
Ethyl benzene	32	ETB	
Ethyl butanol	20	EBT	
N-Ethyl-n-butylamine	7	EBA	
Ethyl butyrate	34	EBR	
Ethyl chloride	36	ECL	
Ethyl cyclohexane	31	ECY	
N-Ethylcyclohexylamine	7	ECC	
Ethylene	30	ETL	
Ethylene carbonate	34		
Ethylene chlorohydrin	20	ECH	
Ethylene cyanohydrin	20	ETC	
Ethylenediamine	<sup>2</sup> 0	EDA	EMX
Ethylenediaminetetracetic acid, tetrasodium salt solution	43	EDS	
Ethylene dibromide	36	EDB	
Ethylene dichloride	<sup>2</sup> 36	EDC	
Ethylene glycol	<sup>2</sup> 0	EGL	
Ethylene glycol acetate	34	EGO	
Ethylene glycol butyl ether, see Ethylene glycol monoalkyl ethers	40	EGM	EGC
Ethylene glycol tert-butyl ether, see Ethylene glycol monoalkyl ethers	40		EGC

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Ethylene glycol butyl ether acetate	34	EMA	
Ethylene glycol diacetate	34	EGY	
Ethylene glycol dibutyl ether	40	EGB	
Ethylene glycol ethyl ether, see Ethylene glycol monoalkyl ethers	40	EGE	EGC/EEO
Ethylene glycol ethyl ether acetate, see 2-Ethoxyethyl acetate	34	EGA	EEA
Ethylene glycol hexyl ether	40	EGH	
Ethylene glycol isopropyl ether, see Ethylene glycol monoalkyl ethers	40	EGI	EGC
Ethylene glycol methyl butyl ether	40	EMB	
Ethylene glycol methyl ether, see Ethylene glycol monoalkyl ethers	40	EME	EGC
Ethylene glycol methyl ether acetate	34	EGT	
Ethylene glycol monoalkyl ethers	40	EGC	
Ethylene glycol phenyl ether	40	EPE	
Ethylene glycol phenyl ether, Diethylene glycol phenyl ether mixture	40	EDX	
Ethylene glycol propyl ether, see Ethylene glycol monoalkyl ethers	40	EGP	EGC
Ethylene oxide	<sup>1</sup> 0	EOX	
Ethylene oxide, Propylene oxide mixture	16	EPM	
Ethylene-Propylene copolymer	30		
Ethylene, Vinyl acetate copolymer emulsion	43		
Ethyl ether	41	EET	
Ethyl-3-ethoxypropionate	34	EEP	
*Ethylhexaldehyde, see Octyl aldehydes	19	EHA	OAL
2-Ethylhexanoic acid, see Octanoic acids	4	EHO	OAY
*2-Ethylhexanol, see Octanol	20	EHX	OCX
2-Ethylhexyl acrylate	14	EAI	
2-Ethylhexylamine	7	EHM	
Ethyl hexyl phthalate	34	EHE	
*Ethyl hexyl tallate	34	EHT	
2-Ethyl-1-(hydroxymethyl)propane-1,3-diol, C8-C10 ester	34	EHD	
Ethylidene norbornene	<sup>2</sup> 30	ENB	
Ethyl methacrylate	14	ETM	
2-Ethyl-6-methyl-N(1'-methyl-2-methoxyethyl)aniline	9	EEM	
o-Ethyl phenol	21	EPL	
Ethyl propionate	34	EPR	
2-Ethyl-3-propylacrolein	<sup>2</sup> 19	EPA	
Ethyl toluene	32	ETE	
*Fatty acids (saturated, C13+)	34	FAD	SRA
Ferric chloride solution	1	FCS	FCL
Ferric hydroxyethylethylenediaminetriacetic acid, trisodium salt solution	<sup>2</sup> 43	FHX	STA
Ferric nitrate, Nitric acid solution	3	FNN	
Fish solubles (water based fish meal extracts)	43	FSO	
Fluorosilicic acid	1	FSJ	
Formaldehyde, Methanol mixtures	<sup>2</sup> 19	MTM	
Formaldehyde solution	<sup>2</sup> 19	FMS	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Formamide	10	FAM	
Formic acid	<sup>2</sup> 4	FMA	
Fructose solution	43		
Fumaric adduct of Rosin, water dispersion	43	FAR	
Furfural	19	FFA	
Furfuryl alcohol	<sup>2</sup> 20	FAL	
Gas oil: cracked	33	GOC	
Gasoline blending stocks: alkylates	33	GAK	
Gasoline blending stocks: reformates	33	GRF	
Gasolines:			
Automotive (not over 4.23 grams lead per gal.)	33	GAT	
Aviation (not over 4.86 grams lead per gal.)	33	GAV	AVA
Casinghead (natural)	33	GCS	
Polymer	33	GPL	
Straight run	33	GSR	
Glucose solution	43		
Glutaraldehyde solution	19	GTA	
Glycerine	<sup>2</sup> 20	GCR	
Glycerine, Dioxanedimethanol mixture	20	GDM	
Glycerol monooleate	20	GMO	
Glycerol polyalkoxylate	34		
Glyceryl triacetate	34		
Glycidyl ester of C10 tridecylacetic acid, see Glycidyl ester of tridecyl acetic acid	34		GLT
Glycidyl ester of tridecylacetic acid	34	GLT	
Glycidyl ester of Versatic acid, see Glycidyl ester of tridecylacetic acid	34		
Glycine, sodium salt solution	7		
Glycol diacetate	34		
Glyoxal solutions	19	GOS	
Glyoxylic acid	4	GAC	
Heptane	31	HMX	HPI/HPT
n-Heptanoic acid	4	HEP	
Heptanol	20	HTX	HTN
Heptene	30	HPX	HTE
Heptyl acetate	34	HPE	
*Herbicide (C15-H22-NO2-Cl), see Metolachlor			MCO
Hexaethylene glycol, see Polyethylene glycol	40		
Hexamethylene glycol	20		
Hexamethylenediamine adipate solution	43	HAM	
Hexamethylenediamine solution	7	HMC	HMD
Hexamethylenetetramine	7	HMT	
Hexamethylenetetramine solutions	7	HTS	
Hexamethylenimine	7	HMI	
Hexane	<sup>2</sup> 31	HXS	IHA/HXA
Hexanoic acid	4	HXO	
Hexanol	20	HXN	
*Hexene	30	HEX	HXE/HXT/MPN/MTN
Hexyl acetate	34	HAE	HSA
Hexylene glycol	20	HXG	



**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Hydrochloric acid	1	HCL	
*Hydrofluorosilicic acid, see Fluorosilicic acid	1	HFS	FSJ
Hydrogen peroxide solutions	<sup>1</sup> 0		HPN/HPS/HPO
2-Hydroxyethyl acrylate	<sup>1,2</sup> 0	HAI	
N-(Hydroxyethyl)ethylenediaminetriacetic acid, trisodium salt solution	43	HET	
2-Hydroxy-4-(methylthio)butanoic acid	4	HBA	
Hydroxy terminated polybutadiene, see polybutadiene, hydroxyl terminated	20		
Isophorone	<sup>2</sup> 18	IPH	
Isophorone diamine	7	IPI	
Isophorone diisocyanate	12	IPD	
Isoprene	30	IPR	
Isopropylbenzene(cumene), see Propylbenzene	32	CUM	PBY/CUM
Jet Fuels:			
JP-4	33	JPF	
JP-5	33	JPV	
JP-8	33	JPE	
Kaolin clay slurry	43		
Kerosene	33	KRS	
Ketone residue	18		
Kraft black liquor	05		KPL
Kraft pulping liquors (Black, Green, or White)	05	KPL	
Lactic acid	<sup>2</sup> 0	LTA	
Lactonitrile solution	37	LNI	
Lard	34		
Latex (ammonia inhibited)	30	LTX	
Latex, liquid synthetic	43	LLS	LTX
Lauric acid	34	LRA	
Lauryl polyglucose (50% or less)	20	LAP	
Lecithin (soyabean)	34	LEC	
Lignin liquor	43		
Liquid Streptomyces solubles	43		
Long chain alkaryl polyether (C11-C20)	41	LCP	
Long chain alkaryl sulfonic acid (C16-C60)	<sup>2</sup> 0	LCS	
Long chain alkylphenate/Phenol sulfide mixture	21		
Long chain polyetheramine in alkyl (C2-C4) benzenes	7	LCE	
Magnesium chloride solution	<sup>1,2</sup> 0		
Magnesium hydroxide slurry	5		
Magnesium long chain alkaryl sulfonate (C11-C50)	34	MAS	
Magnesium long chain alkyl phenate sulfide (C8-C20)	34	MPS	
Magnesium long chain alkyl salicylate (C11+)	34	MLS	
*Magnesium nonyl phenol sulfide, see Magnesium long chain alkyl phenate sulfide (C8-C20)			MPS
Magnesium sulfonate, see Magnesium long chain sulfonate (C11-C50)	34	MSE	MAS
Maleic anhydride	11	MLA	
Mercaptobenzothiazol, sodium salt solution	05		SMB
Mesityl oxide	<sup>2</sup> 18	MSO	
Metam sodium solution	07	MSS	SMD

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Methacrylic acid	04	MAD	
Methacrylic resin in Ethylene dichloride	14	MRD	
Methacrylonitrile	15	MET	
Methane	31	MTH	
3-Methoxy-1-butanol	20		
3-Methoxybutyl acetate	34	MOA	
N-(2-Methoxy-1-methyl ethyl)-2-ethyl-6-methyl chloroacetanilide, see Metolachlor			
1-Methoxy-2-propyl acetate	34	MPO	
Methoxy triglycol	40	MTG	
Methyl acetate	34	MTT	
Methyl acetoacetate	34	MAE	
Methyl acetylene, propadiene mixture	30	MAP	
Methyl acrylate	14	MAM	
Methyl alcohol	<sup>2</sup> 20	MAL	
Methylamine solution	7	MSZ	
Methyl amyl acetate	34	MAC	
*Methyl amyl alcohol	20	MAA	MIC
Methyl amyl ketone	18	MAK	
Methyl bromide	36	MTB	
Methyl butenol	20	MBL	
Methyl butyl ketone	18	MBK	
Methyl tert-butyl ether	<sup>2</sup> 41	MBE	
Methylbutynol	20	MBY	
3-Methyl butyraldehyde	19		
Methyl butyrate	34	MBU	
Methyl chloride	36	MTC	
Methylcyclohexane	31	MCY	
Methylcyclopentadiene dimer	30	MCK	
Methyl diethanolamine	8	MDE	MAB
2-Methyl-6-ethyl aniline	9	MEN	
Methyl ethyl ketone	<sup>2</sup> 18	MEK	
2-Methyl-5-ethylpyridine	9	MEP	
Methyl formate	34	MFM	
N-Methylglucamine solution	43	MGC	
N-Methylglucamine solution (70% or less)	43	MGC	
Methyl heptyl ketone	18	MHK	
2-Methyl-2-hydroxy-3-butyne	20	MHB	
Methyl isoamyl ketone	18		MAK
Methyl isobutyl carbinol, see Methyl amyl alcohol	20	MIC	MAA
Methyl isobutyl ketone	<sup>2</sup> 18	MIK	
Methyl methacrylate	14	MMM	
3-Methyl-3-methoxybutanol	20		
3-Methyl-3-methoxybutyl acetate	34		
Methyl naphthalene	32	MNA	
Methylolureas	19	MUS	
2-Methyl pentane	31		IHA
2-Methyl-1-pentene, see Hexene	30	MPN	HEX
*4-Methyl-1-pentene, see Hexene	30	MTN	HEX
Methyl propyl ketone	18	MKE	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Methylpyridine	9		MPR/MPE/MPF
N-Methyl-2-pyrrolidone	<sup>2</sup> 9	MPY	
Methyl Salicylate	34	MES	
alpha-Methylstyrene	30	MSR	
Metolachlor	34	MCO	
Milk	43		
Mineral spirits	33	MNS	
Molasses	20		
Molasses residue	0		
Monochlorodifluoromethane	36	MCF	
Morpholine	<sup>2</sup> 7	MPL	
Motor fuel anti-knock compounds containing lead alkyls	<sup>1</sup> 0	MFA	
Myrcene	30	MRE	
Naphtha:			
Aromatic	33		
Coal tar solvent	33	NCT	
Cracking fraction	<sup>2</sup> 33		
Heavy	33		
Paraffinic	33		
Petroleum	33	PTN	
Solvent	33	NSV	
Stoddard Solvent	33	NSS	
Varnish Makers' and Painters'	33	NVM	
Naphthalene	32	NTM	
Naphthalene sulfonic acid-formaldehyde copolymer, sodium salt solution	0	NFS	
Naphthalene sulfonic acid, sodium salt solution	34	NSA	
Naphthenic acids	4	NTI	
Naphthenic acid, sodium salt solution	43	NTS	
Neodecanoic acid	4	NEA	
Nitrating acid	<sup>1</sup> 0	NIA	
Nitric acid (70% or less)	3	NCD	
Nitric acid (Greater than 70%)	<sup>1</sup> 0		NAC
Nitrobenzene	42	NTB	
o-Nitrochlorobenzene, see Chloronitrobenzene	42		CNO/CNP
Nitroethane	42	NTE	
o-Nitrophenol	<sup>1,2</sup> 0	NTP	NIP/NPH
Nitropropane	42	NPM	NPN/NPP
Nitropropane, Nitroethane mixture	42		NNM/NNL
Nitrotoluene	42	NIT	NIE/NTT/NTR
Nonane	31	NAX	NAN
Nonanoic acid	4	NNA	NAI/NIN
Nonanoic, Tridecanoic acid mixture	4	NAT	
*Nonene	30	NOO	NON/NNE
Nonyl acetate	34	NAE	
*Nonyl alcohol	<sup>2</sup> 0	NNS	NNI/NNN/DBC
Nonyl methacrylate	14	NMA	
Nonylphenol	21	NNP	
Nonyl phenol (ethoxylated)	40		NPE
Nonyl phenol poly(4-12)ethoxylates	40	NPE	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
*Nonyl phenol sulfide solution, see Alkyl phenol sulfide (C8-C40)			AKS/NPS
Noxious Liquid Substance, n.o.s. (NLS's)	0		
1-Octadecene	30		
Octadecenoamide	10	ODD	
Octane	31	OAX	IOO/OAN
*Octanoic acid	4	OAY	OAA/EHO
Octanol	<sup>2</sup> 20	OCX	IOA/OTA/EHX
Octene	30	OTX	OTE
n-Octyl acetate	34	OAF	OAE
*Octyl alcohol, see (Octanol)	<sup>2</sup> 20	OCX	IOA/OTA
*Octyl aldehyde	19	OAL	IOC/OLX/EHA
Octyl decyl adipate	34	ODA	
Octyl nitrate, see Alkyl (C7-C9) nitrates	<sup>2</sup> 34	ONE	AKN
Octyl phenol	21		
Octyl phthalate, see Dialkyl (C7-C13) phthalates	34		DAH
Oil, edible:			
Beechnut	34	OBN	VEO
*Castor	34	OCA	VEO
Cocoa butter	34	OCB	VEO
Coconut	<sup>2</sup> 34	OCC	VEO
Cod liver	34	OCL	AFN
*Corn	34	OCO	VEO
*Cottonseed	34	OCS	VEO
*Fish	<sup>2</sup> 34	OFF	AFN
Groundnut	34	OGN	VEO
Hazelnut	34	OHN	VEO
*Lard	34	OLD	AFN
Maize	34		VEO/OCO
Nutmeg butter	34	ONB	VEO
*Olive	34	OOL	VEO
*Palm	<sup>2</sup> 34	OPM	VEO
*Palm kernel	34	OPO	VEO
*Peanut	34	OPN	VEO
Poppy	34	OPY	VEO
Poppy seed	34		VEO
Raisin seed	34	ORA	VEO
*Rapeseed	34	ORP	VEO
*Rice bran	34	ORB	VEO
*Safflower	34	OSF	VEO
Salad	34	OSL	VEO
Sesame	34	OSS	VEO
*Soya bean	34	OSB	VEO
*Sunflower seed	34	OSN	VEO
*Tucum	34	OTC	VEO
*Vegetable	34	OVG	VEO
Walnut	34	OWN	VEO
Oil, fuel:			
No. 1	33	OON	
No. 1-D	33	OOD	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
No. 2	33	OTW	
No. 2-D	33	OTD	
No. 4	33	OFR	
No. 5	33	OFV	
No. 6	33	OSX	
Oil, misc:			
Aliphatic	33		
Animal	34	OMA	AFN
Aromatic	33		
Clarified	33	OCF	
Coal	33		
Coconut oil, fatty acid methyl ester	34	OCM	
Cotton seed oil, fatty acid	34	CFY	
Crude	33	OIL	
Diesel	33	ODS	
Gas, high pour	33		
Gas, low pour	33		
Gas, low sulfur	33		
Heartcut distillate	33		
Lanolin	34	OLL	AFN
Linseed	33	OLS	
Lubricating	33	OLB	
Mineral	33	OMN	
Mineral seal	33	OMS	
Motor	33	OMT	
*Neatsfoot	33	ONF	AFN
Oiticica	34	OOI	
Palm oil, fatty acid methyl ester	34	OPE	
Penetrating	33	OPT	
Perilla	34	OPR	
Pilchard	34	OPL	AFN
Pine	33	OPI	
Residual	33		
Road	33	ORD	
Rosin	33	ORN	
Seal	34		
Soapstock	34	OIS	
*Soybean (epoxidized)	34		EVO
*Sperm	33	OSP	AFN
Spindle	33	OSD	
Tall	34	OTL	
Tall, fatty acid	<sup>2</sup> 34	TOF	
Transformer	33	OTF	
Tung	34	OTG	
Turbine	33	OTB	
Wood	34		
Olefin/Alkyl ester copolymer (molecular weight 2000+)	34	OCP	
Olefin mixtures	30		OFX/OFY
alpha-Olefins (C6 - C18) mixtures	30	OAM	
Olefins (C13+)	30		

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Oleic acid	04	OLA	
Oleum	<sup>1,2</sup> 0	OLM	
Oleylamine	10	OLY	
Oxyalkylated alkyl phenol formaldehyde	33		
Palm kernel acid oil	34	PNO	
Palm kernel dacid oil, methyl ester	34	PNF	
*Palm kernel oil, fatty acid, see Palm kernel acid oil			
*Palm kernel oil, fatty acid methyl ester, see Palm kernel acid oil, methyl ester			
Palm stearin	34	PMS	
n-Paraffins (C10 - C20), see n-Alkanes (C10+)	31	PFN	
Paraldehyde	19	PDH	
Pentachloroethane	36	PCE	
Pentadecanol, see alcohols (C13+)	20	PDC	ALY
1,3-Pentadiene	30	PDE	PDN
Pentaethylenehexamine	7	PEN	
Pentaethylenehexamine, Tetraethylenepentamine mixture	7	PEP	
Pentane	31	PTY	IPT/PTA
Pentanoic acid	4	POC	
Pentene	30	PTX	PTE
Pentene, Miscellaneous hydrocarbon mixture	<sup>2</sup> 30		
Pentyl aldehyde	19		
n-Pentyl propionate	34	PPE	
Perchloroethylene	36	PER	
Petrolatum	33	PTL	
Phenol	21	PHN	
1-Phenyl-1-xylyl ethane	32	PXE	
Phosphoric acid	1	PAC	
Phosphorus	<sup>1</sup> 0		PPW/PPR/PPB
Phthalic anhydride (molten)	11	PAN	
Phthalate based polyester polyol	<sup>2</sup> 0	PBE	
alpha-Pinene	30	PIO	
beta-Pinene	30	PIP	
*Pinene	30	PIN	PIO/PIP
*Pine oil	33	PNL	OPI
Polyalkyl (C18 - C22) acrylate in Xylene	14	PIX	
Polyalkylene glycol butyl ether, see Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether	40	PGB	PAG
Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether	40	PAG	
Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether acetate	34	PAF	
Polyalkylene glycols, polyalkylene glycol monoalkyl ethers mixtures	40	PPX	
Polyalkylene oxide polyol	20	PAO	
Polyalkyl methacrylate (C1-C20)	14	PMT	
Polyaluminum chloride solution	1		
Polybutadiene, hydroxyl terminated	20		
Polybutene	30	PLB	
Polybutenyl succinimide	10	PBS	
Poly(2+)cyclic aromatics	32	PCA	
Polydimethylsiloxane	34		

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Polyether (molecular weight 2000+)	41	PYR	
Polyethylene glycol	40		
Polyethylene glycol dimethyl ether	40		
Polyethylene glycol monoalkyl ether, see Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether	40	PEE	PAG
Polyethylene polyamines	<sup>2</sup> 7	PEB	
Polyferric sulfate solution	34	PSS	
Polyglycerine, Sodium salts solution (containing less than 3% Sodium hydroxide)	<sup>2</sup> 20	PGT	
Polyglycerol	20		GCR
Poly(4+)isobutylene	30		
Polymethylene polyphenyl isocyanate	12	PPI	
Polymethylsiloxane	34		
Polyolefin (molecular weight 300+)	30		
Polyolefin amide alkeneamine (C28+)	7	POD	
Polyolefin amide alkeneamine borate (C28-C250)	34	PAB	
Polyolefin amide alkeneamine/Molybdenum oxysulfide mixture	7		
Polyolefin amide alkeneamine polyol	7	PAP	
Polyolefinamine in alkyl(C2-C4)benzenes	7	POF	
Polyolefin anhydride	11	PAR	
Polyolefin ester (C28-C250)	34	POS	
Polyolefin phenolic amine (C28-C250)	7	PPH	
Polyolefin phosphorosulfide, barium derivative (C28-C250)	34	PPS	
Poly(20)oxyethylene sorbitan monooleate	34	PSM	
Polypropylene	30	PLP	
Poly(5+)propylene	30	PLQ	
Polypropylene glycol	40	PGC	
Polypropylene glycol methyl ether	40	PGM	
*Polysiloxane	34		DMP
Potassium chloride solution	43	PCS	(DRB)
Potassium hydroxide solution	<sup>2</sup> 5		CPS
Potassium oleate	34	POE	
Potassium polysulfide, Potassium thiosulfide solution (41% or less)	0	PTG	
Potassium thiosulfate solution	43	PTF	
Propane	31	PRP	
Propanil, Mesityl oxide, Isophorone mixture	7	PMI	
Propanolamine	8	PAX	MPA/PLA
Propionaldehyde	19	PAD	
Propionic acid	4	PNA	
Propionic anhydride	11	PAH	
Propionitrile	37	PCN	
n-Propoxypropanol, see Propylene glycol monoalkyl ether	40	PXP	PGE
Propyl acetate	34		IAC/PAT
Propyl alcohol	<sup>2</sup> 20		IPA/PAL
Propyl amine	7		IPO/IPP/PRA
Propylbenzene	32	PBY	PBZ/CUM
n-Propyl chloride	36	PRC	
iso-Propylcyclohexane	31	IPX	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Propylene	30	PPL	
Propylene butylene polymer	30	PBP	
Propylene carbonate	34		
Propylene dimer	30	PDR	
Propylene glycol	<sup>2</sup> 20	PPG	
Propylene glycol n-butyl ether, see Propylene glycol monoalkyl ether	40	PGD	PGE
Propylene glycol ethyl ether, see Propylene glycol monoalkyl ether	40	PGY	PGE
Propylene glycol methyl ether, see Propylene glycol monoalkyl ether	40	PME	PGE
Propylene glycol methyl ether acetate	34	PGN	
Propylene glycol monoalkyl ether	40	PGE	PME/PGY
Propylene glycol propyl phenyl ether	40	PGP	
Propylene glycol propyl ether, see Propylene glycol monoalkyl ether	40		PGE
Propylene oxide	16	POX	
Propylene tetramer	30	PTT	
Propylene trimer	30	PTR	
Propyl ether	41		IPE/PRE
*Pseudocumene, see Trimethylbenzene	32		TME/TRE
Pyridine	9	PRD	
Pyridine bases	9	PRB	
Rosin oil	33	ORN	
Rosin soap (disproportionated) solution	43	RSP	
*Rum, see Alcoholic beverages	20		
Sewage sludge	43		
Silica slurry	43		
Sludge, treated	43		
Sodium acetate, Glycol, Water mixture (not containing Sodium hydroxide)	<sup>2</sup> 34	SAO	SAP
Sodium acetate, Glycol, Water mixture (containing Sodium hydroxide)	5	SAP	SAO
Sodium acetate solution	34	SAN	
Sodium alkyl sulfonate solution	43	SSU	
Sodium aluminate solution	5	SAU	
Sodium aluminosilicate slurry	34		
Sodium benzoate solution	34	SBN	
Sodium borohydride, sodium hydroxide solution	5	SBX	SBH/SBI
Sodium carbonate solutions	5	SCE	
Sodium chlorate solution	<sup>1,2</sup> 0	SDD	SDC
Sodium cyanide solution	5	SCS	SCN
Sodium dichromate solution	<sup>1,2</sup> 0	SDL	SCR
Sodium dimethyl naphthalene sulfonate solution	<sup>2</sup> 34		DNS
Sodium hydrogen sulfide, Sodium carbonate solution	<sup>2</sup> 0	SSS	
Sodium hydrogen sulfite solution	43	SHX	
Sodium hydrosulfide solution	<sup>2</sup> 5	SHR	
Sodium hydrosulfide, Ammonium sulfide solution	<sup>2</sup> 5	SSA	
Sodium hydroxide solution	<sup>2</sup> 5		CSS
Sodium hypochlorite solution	5	SHP	SHC



**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Sodium long chain alkyl salicylate (C13+)	34	SLS	
Sodium 2-mercaptobenzothiazol solution	5	SMB	
Sodium naphthalene sulfonate solution	34	SNS	
Sodium naphthenate solution, see Naphthenic acid, sodium salt solution	5		
Sodium nitrite solution	5	SNI	SNT
Sodium petroleum sulfonate	33	SPS	
Sodium polyacrylate solution	<sup>2</sup> 43		
Sodium salt of Ferric hydroxyethylethylenediamine triacetic acid solution	43	STA	FHX
Sodium silicate solution	<sup>2</sup> 43	SSN	SSC
Sodium sulfide, hydrosulfide solution	<sup>1,2</sup> 0		SSH/SSI/SSJ
Sodium sulfide solution	43	SDR	
Sodium sulfite solution	43	SUP	SUS
Sodium tartrates, Sodium succinates solution	43	STM	
Sodium thiocyanate solution	<sup>1,2</sup> 0	STS	SCY
Sorbitol solutions	20		SBT
Soyabean oil (epoxidized)	34		OSC/EVO
Stearic acid, see Fatty acids (saturated, C13+)	34	SRA	FAD
Stearyl alcohol	20		
Styrene	30	STY	STX
Sulfolane	39	SFL	
Sulfohydrocarbon (C3-C88)	33	SFO	
Sulfohydrocarbon, long chain (C18+) alkylamine mixture	7	SFX	
Sulfonated polyacrylate solutions	<sup>2</sup> 43		
Sulfur	<sup>1</sup> 0	SXX	
Sulfuric acid	<sup>2</sup> 2	SFA	
Sulfuric acid, spent	2	SAC	
Tall oil	34	OTL	
Tall oil fatty acid, barium salt	<sup>2</sup> 0	TOB	
Tall oil soap (disproportionated) solution	43	TOS	
Tallow	<sup>2</sup> 34	TLO	
Tallow fatty acid	<sup>2</sup> 34	TFD	
Tallow fatty alcohol, see Alcohols (C13+)	20	TFA	ALY
Tallow nitrile	37	TAN	
1,1,2,2-Tetrachloroethane	36	TEC	
*Tetradecanol, see Alcohols (C13+)	20	TTN	ALY
*Tetradecene, see the olefins entries	30	TTD	
Tetradecylbenzene	32	TDB	AKB
Tetraethylene glycol	40	TTG	
Tetraethylenepentamine	7	TTP	
Tetrahydrofuran	41	THF	
Tetrahydronaphthalene	32	THN	
*1,2,3,5-Tetramethylbenzene, see Tetramethylbenzene	32	TTB	TTC
Tetramethylbenzene	32	TTC	TTB
Tetrapropylbenzene, see Alkyl(C9+)benzenes	32		AKB
Tetrasodium salt of EDTA solution	43		EDS
Titanium tetrachloride	2	TTT	
Toluene	32	TOL	
Toluenediamine	9	TDA	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
Toluene diisocyanate	12	TDI	
o-Toluidine	9	TLI	
*Triarylphosphate, see Triisopropylated phenyl phosphates	34		TPL
Tributyl phosphate	34	TBP	
1,2,4-Trichlorobenzene	36	TCB	
1,1,1-Trichloroethane	<sup>2</sup> 36	TCE	
1,1,2-Trichloroethane	36	TCM	
Trichloroethylene	<sup>2</sup> 36	TCL	
1,2,3-Trichloropropane	36	TCN	
1,1,2-trichloro-1,2,2-trifluoroethane	36	TTF	
Tricresyl phosphate	34		TCO/TCP
*Tridecane, see n-Alkanes (C10+)	31	TRD	
Tridecanoic acid	34		
*Tridecanol, see Alcohols (C13+)	20	TDN	ALY
*Tridecene, see Olefins (C13+)	30	TDC	
Tridecyl acetate	34	TAE	
Tridecylbenzene	32	TRB	AKB
Triethanolamine	<sup>2</sup> 8	TEA	
Triethylamine	7	TEN	
Triethylbenzene	32	TEB	
Triethylene glycol	40	TEG	
Triethylene glycol butyl ether, see Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether	40		PAG
Triethylene glycol butyl ether mixture	40		
Triethylene glycol di-(2-ethylbutyrate)	34	TGD	
Triethylene glycol ether mixture	40		
Triethylene glycol ethyl ether, see Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether	40	TGE	PAG
Triethylene glycol methyl ether, see Poly(2-8) alkylene glycol monoalkyl (C1-C6) ether	40	TGY	PAG
Triethylenetetramine	<sup>2</sup> 7	TET	
Triethyl phosphate	34	TPS	
Triethyl phosphite	<sup>2</sup> 34	TPI	
Trifluralin in Xylene	18	TFX	
Triisobutylene	30	TIB	
Triisooctyl trimellitate	34		
Triisopropanolamine	8	TIP	
Triisopropanolamine salt of 2,4-Dichlorophenoxyacetic acid solution	43		
Triisopropylated phenyl phosphates	34	TPL	
Trimethylacetic acid	4	TAA	
Trimethylamine solution	7	TMT	
Trimethylbenzene	32	TRE	TME/TMB/TMD
Trimethylhexamethylenediamine (2,2,4- and 2,4,4-)	7	THA	
Trimethylhexamethylene diisocyanate (2,2,4- and 2,4,4-)	12	THI	
Trimethylol propane polyethoxylate	20	TPR	
2,2,4-Trimethyl pentanediol-1,3-diisobutyrate, see 2,2,4-Trimethyl-1,3-pentanediol diisobutyrate			
2,2,4-Trimethyl-1,3-pentanediol diisobutyrate	34	TMQ	

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

Chemical Name	Group No.	CHRIS Code	Related CHRIS codes
2,2,4-Trimethyl-1,3-pentanediol-1-isobutyrate	34	TMP	
2,2,4-Trimethyl-3-pentanol-1-isobutyrate	34		
Trimethyl phosphite	<sup>2</sup> 34	TPP	
1,3,5-Trioxane	<sup>2</sup> 41	TRO	
Triphenylborane, Caustic soda solution	5	TPB	
*Tripropylene, see Propylene trimer	30		PTR
Tripropylene glycol	40	TGC	
*Tripropylene glycol methyl ether, see Poly (2-8) alkylene glycol monoalkyl (C1-C6) ether	40	TGM	PAG
Trisodium nitrilotriacetate	34		
Trisodium phosphate solution	5	TSP	
Trisilyl Phosphate, see Trixylenyl phosphate	34		TRP
Trixylenyl phosphate	34	TRP	
Turpentine	30	TPT	
Undecanoic acid	4	UDA	
Undecanol, see Undecyl alcohol	20		UND
Undecene	30	UDC	
Undecyl alcohol	20	UND	
Undecylbenzene	32	UDB	AKB
Urea, Ammonium mono- and di-hydrogen phosphate, Potassium chloride solution	0	UPX	
Urea, Ammonium nitrate solution (containing Ammonia)	6	UAS	
Urea, Ammonium nitrate solution (not containing Ammonia)	43	UAT	ANU
Urea, Ammonium phosphate solution	43	UAP	
Urea solution	43		URE
Valeraldehyde	19	VAK	IVA/VAL
Vanillin black liquor	5	VLB	
Vegetable acid oils and distillates, n.o.s.	34	VAO	
Vegetable oils, n.o.s.	34	VEO	
Vegetable protein solution	43		
Vinyl acetate	13	VAM	
Vinyl chloride	35	VCM	
Vinyl ethyl ether	13	VEE	
Vinylidene chloride	35	VCI	
Vinyl neodecanoate	13	VND	
Vinyltoluene	13	VNT	
Water	43		
Waxes:		WAX	
Candelilla	34	WDC	
Carnauba	34	WCA	
Paraffin	31	WPF	
Petroleum	33		
White Spirit (low(15-20%) aromatic)	33	WSL	WSP
Xylene	32	XLX	XML/XLO/XLP
Xylenols	21	XYL	
Zinc alkaryl dithiophosphate (C7-C16)	34	ZAD	
Zinc alkenyl carboxamide	10	ZAA	
Zinc alkyl dithiophosphate (C3-C14)	34	ZAP	
Zinc bromide, Calcium bromide solution see Drilling brine	43		DZB

**TABLE 7.1**  
**ALPHABETICAL LISTING OF COMPOUNDS**

<b>Chemical Name</b>	<b>Group No.</b>	<b>CHRIS Code</b>	<b>Related CHRIS codes</b>
(containing Zinc salts			

**FOOTNOTES TO TABLE**

Items with an asterisk (\*) are changes per CGD 92-100.

<sup>1</sup> Because of very high reactivity or unusual conditions of carriage or potential compatibility problems, this product is not assigned to a specific group in the Compatibility Chart. For additional compatibility information, contact Commandant (G-MSO), U.S. Coast Guard, 2100 Second Street, SW., Washington, DC 20593-0001. Telephone (202) 267-1577.

<sup>2</sup> See Table 7.3 - Exceptions to the Chart.

**TABLE 7.2**  
**REACTIVITY GROUPS**

**0. UNASSIGNED CARGOES**

Acetone cyanohydrin<sup>1,2</sup>  
 Alkylbenzenesulfonic acid<sup>1,2</sup>  
 Aluminum chloride, Hydrochloric acid solution  
 Ammonium hydrogen phosphate solution<sup>1</sup>  
 Ammonium nitrate solution<sup>1</sup>  
 Ammonium thiocyanate, Ammonium thiosulfate solution<sup>1</sup>  
 Benzenesulfonyl chloride<sup>1,2</sup>  
 gamma-Butyrolactone<sup>1,2</sup>  
 Chlorine<sup>1</sup>  
 Chlorosulfonic acid<sup>1</sup>  
 Decyloxytetrahydro-thiophene dioxide<sup>2</sup>  
 2,4-Dichlorophenoxyacetic acid, Dimethylamine salt solution<sup>1,2</sup>  
 Dimethylamine salt of 2,4-dichlorophenoxyacetic acid solution<sup>1,2</sup>  
 Diphenylol propane-Epichlorohydrin resins<sup>1</sup>  
 Dodecylbenzenesulfonic acid<sup>1,2</sup>  
 Dodecylhydroxypropyl sulfide<sup>2</sup>  
 Ethylene oxide<sup>1</sup>  
 Fluorosilicic acid  
 2-Hydroxyethyl acrylate<sup>1,2</sup>  
 Lactic acid<sup>2</sup>  
 Long chain alkaryl sulfonic acid (C16-C60)<sup>2</sup>  
 Magnesium chloride solution<sup>1,2</sup>  
 Molasses residue<sup>1</sup>  
 Motor fuel anti-knock compounds containing lead alkyls<sup>1</sup>  
 Naphthalene sulfonic acid-formaldehyde copolymer, sodium salt solution<sup>1</sup>  
 Nitrating acid<sup>1</sup>  
 Nitric acid (Greater than 70%)<sup>1</sup>  
 o-Nitrophenol<sup>1,2</sup>  
 Noxious Liquid Substance, n.o.s. (NLS's)<sup>1</sup>  
 Oleum<sup>1,2</sup>  
 Phosphorus<sup>1</sup>  
 Phthalate based polyester polyol<sup>2</sup>  
 Potassium polysulfide, potassium thiosulfide solution (41% or less)  
 Sodium chlorate solution<sup>1,2</sup>  
 Sodium dichromate solution<sup>1,2</sup>  
 Sodium hydrogen sulfide, Sodium carbonate solution<sup>1,2</sup>  
 Sodium sulfide, hydrosulfide solution<sup>1,2</sup>  
 Sodium thiocyanate solution<sup>1,2</sup>  
 Sulfur<sup>1</sup>  
 Tall oil fatty acid, barium salt<sup>2</sup>

Urea, Ammonium mono- and di-hydrogen phosphate, Potassium chloride solution

**1. NON-OXIDIZING MINERAL ACIDS**

Di-(2-ethylhexyl)phosphoric acid  
 Ferric chloride solution  
 Fluorosilicic acid  
 Hydrochloric acid  
 Phosphoric acid  
 Polyaluminum chloride solution

**2. SULFURIC ACIDS**

Sulfuric acid<sup>2</sup>  
 Sulfuric acid, spent  
 Titanium tetrachloride

**3. NITRIC ACID**

Ferric nitrate, Nitric acid solution  
 Nitric acid (70% or less)

**4. ORGANIC ACIDS**

Acetic acid<sup>2</sup>  
 Acrylic acid<sup>2</sup>  
 Butyric acid  
 Cashew nut shell oil (untreated)  
 Chloroacetic acid solution  
 Chloropropionic acid  
 Citric acid  
 Decanoic acid  
 2,2-Dichloropropionic acid  
 2,2-Dimethyloctanoic acid  
 2-Ethylhexanoic acid  
 Formic acid<sup>2</sup>  
 Glyoxylic acid  
 n-Heptanoic acid  
 Hexanoic acid  
 2-Hydroxy-4-(methylthio)butanoic acid  
 Methacrylic acid  
 Naphthenic acids  
 Neodecanoic acid  
 Nonanoic acid  
 Nonanoic, tridecanoic acid mixture  
 Octanoic acid  
 Pentanoic acid  
 Propionic acid

Trimethylacetic acid  
Undecanoic acid

## 5. CAUSTICS

Ammonium sulfide solution  
Calcium hypochlorite solutions  
Caustic potash solution<sup>2</sup>  
Caustic soda solution<sup>2</sup>  
Cresylate spent caustic  
Cresylic acid, sodium salt solution  
Kraft black liquor  
Kraft pulping liquors  
Mercaptobenzothiazol, sodium salt solution  
Potassium hydroxide solution<sup>2</sup>  
Sodium acetate, glycol, water mixture  
(containing sodium hydroxide)  
Sodium aluminate solution  
Sodium borohydride, sodium hydroxide solution  
Sodium carbonate solutions  
Sodium cyanide solution  
Sodium hydrosulfide solution<sup>2</sup>  
Sodium hydrosulfide, Ammonium sulfide  
solution<sup>2</sup>  
Sodium hydroxide solution<sup>2</sup>  
Sodium hypochlorite solution  
Sodium 2-mercaptobenzothiazol solution  
Sodium naphthenate solution  
Sodium nitrite solution  
Triphenylborane, caustic soda solution  
Trisodium phosphate solution  
Vanillin black liquor

## 6. AMMONIA

Ammonia, anhydrous  
Ammonia, aqueous  
Ammonium hydroxide (28% or less ammonia)  
Ammonium nitrate-urea solution (containing  
ammonia)  
Urea, Ammonium nitrate solution (containing  
Ammonia)

## 7. ALIPHATIC AMINES

N-Aminoethyl piperazine  
Butylamine  
Calcium long chain alkyl phenolic amine (C8-  
C40)  
Cyclohexylamine  
Dibutyl amine  
Diethylamine<sup>2</sup>  
Diethylenetriamine  
Diisobutylamine  
Diisopropylamine  
Dimethylamine

Dimethylamine solution  
N,N-Dimethylcyclohexylamine  
Di-n-propylamine  
Diphenylamine, reaction product with 2,2,4-  
trimethylpentene  
Diphenylamines, alkylated  
Dodecylamine, tetradecylamine mixture<sup>2</sup>  
Dodecylmethylamine, tetradecyldimethylamine  
mixture  
Ethylamine<sup>2</sup>  
Ethylamine solution  
N-Ethyl-n-butylamine  
N-Ethylcyclohexylamine  
Ethylenediamine<sup>2</sup>  
2-Ethylhexylamine  
Hexamethylenediamine solution  
Hexamethylenetetramine  
Hexamethylenetetramine solutions  
Hexamethylenimine  
Isophorone diamine  
Long chain polyetheramine in alkyl (C2-C4)  
benzenes  
Metam sodium solution  
Methylamine solution  
Morpholine<sup>2</sup>  
Pentaethylenehexamine  
Pentaethylenehexamine,  
Tetraethylenepentamine mixture  
Polyalkyl methacrylate (C1-C20)  
Polyolefin amide alkeneamine (C28+)  
Polyolefin amide alkeneamine/Molybdenum  
oxysulfide mixture  
Polyethylene polyamines<sup>2</sup>  
Polyolefin amide alkeneamine polyol  
Polyolefinamine in alkyl (C2-C4) benzenes  
Polyolefin phenolic amine (C28-C250)  
Propanil, mesityl oxide, isophorone mixture  
Propyl amine  
Sulfohydrocarbon, long chain (C18+) alkylamine  
mixture  
Tetraethylenepentamine  
Triethylamine  
Triethylenetetramine<sup>2</sup>  
Trimethylamine solution  
Trimethylhexamethylenediamine (2,2,4- and  
2,4,4-)

## 8. ALKANOLAMINES

2-(2-Aminoethoxy)ethanol  
Aminoethyldiethanolamine,  
Aminoethylethanolamine solution  
Aminoethylethanolamine  
2-Amino-2-methyl-1-propanol  
Diethanolamine  
Diethylaminoethanol

Diethylethanolamine  
Diisopropanolamine  
Dimethylethanolamine  
Ethanolamine  
Propanolamine  
Triethanolamine<sup>2</sup>  
Triisopropanolamine

## 9. AROMATIC AMINES

Aniline  
4-Chloro-2-methylphenoxyacetic acid,  
Dimethylamine salt solution  
2,6-Diethylaniline  
Dimethylamine salt of 4-Chloro-2-  
methylphenoxyacetic acid solution  
2,6-Dimethylaniline  
2-Ethyl-6-methyl-N-(1'-methyl-2-  
methoxyethyl)aniline  
2-Methyl-6-ethyl aniline  
2-Methyl-5-ethyl pyridine  
Methylpyridine  
3-Methylpyridine  
N-Methyl pyrrolidone  
Pyridine  
Pyridine bases  
Toluenediamine  
p-Toluidine

## 10. AMIDES

Acrylamide solution  
Alkenyl (C11+) amide  
N,N-Dimethylacetamide  
N,N-Dimethylacetamide solution  
Dimethylformamide  
Formamide  
Octadecenoamide

## 11. ORGANIC ANHYDRIDES

Acetic anhydride  
Alkenylsuccinic anhydride  
Maleic anhydride  
Phthalic anhydride  
Polyolefin anhydride  
Propionic anhydride

## 12. ISOCYANATES

Diphenylmethane diisocyanate  
Isophorone diisocyanate  
Polymethylene polyphenyl isocyanate  
Toluene diisocyanate  
Trimethylhexamethylene diisocyanate (2,2,4-  
and 2,4,4-)

## 13. VINYL ACETATE

Vinyl acetate  
Vinyl ethyl ether  
Vinyl neodecanoate  
Vinyl toluene

## 14. ACRYLATES

Butyl acrylate  
Butyl methacrylate  
Butyl methacrylate, decyl methacrylate, cetyl  
eicosyl methacrylate mixture  
Cetyl eicosyl methacrylate mixture  
Decyl acrylate  
Dodecylmethacrylate  
Dodecyl, pentadecyl methacrylate mixture  
Ethyl acrylate  
2-Ethylhexyl acrylate  
Ethyl methacrylate  
Methacrylic resin in ethylene dichloride  
Methyl acrylate  
Methyl methacrylate  
Nonyl methacrylate  
Polyalkyl (C18 - C22) acrylate in Xylene  
Polyalkyl methacrylate (C1-C20)

## 15. SUBSTITUTED ALLYLS

Acrylonitrile<sup>2</sup>  
Allyl alcohol<sup>2</sup>  
Allyl chloride  
1,3-Dichloropropene  
Dichloropropene, dichloropropane mixture  
Methacrylonitrile

## 16. ALKYLENE OXIDES

Butylene oxide  
Ethylene oxide, Propylene oxide mixture  
Propylene oxide

## 17. EPICHLOROHYDRIN

Chlorohydrins  
Epichlorohydrin

## 18. KETONES

Acetone<sup>2</sup>  
Acetophenone  
Amyl methyl ketone  
Butyl heptyl ketone  
Camphor oil  
Cyclohexanone

Cyclohexanone, cyclohexanol mixture<sup>2</sup>  
 Diisobutyl ketone  
 Epoxy resin  
 Ethyl amyl ketone  
 Isophorone<sup>2</sup>  
 Ketone residue  
 Mesityl oxide<sup>2</sup>  
 Methyl amyl ketone  
 Methyl butyl ketone  
 Methyl diethenolamine  
 Methyl ethyl ketone<sup>2</sup>  
 Methyl heptyl ketone  
 Methyl isoamyl ketone  
 Methyl isobutyl ketone<sup>2</sup>  
 Methyl propyl ketone  
 Trifluralin in xylene

## 19. ALDEHYDES

Acetaldehyde  
 Acrolein<sup>2</sup>  
 Butyraldehyde  
 Crotonaldehyde<sup>2</sup>  
 Decaldehyde  
 Ethylhexaldehyde  
 2-Ethyl-3-propylacrolein<sup>2</sup>  
 Formaldehyde solution<sup>2</sup>  
 Formaldehyde, Methanol mixtures<sup>2</sup>  
 Furfural  
 Glutaraldehyde solution  
 Glyoxal solutions  
 3-Methyl butyraldehyde  
 Methylolureas  
 Octyl aldehyde  
 Paraldehyde  
 Pentyl aldehyde  
 Propionaldehyde  
 Valeraldehyde

## 20. ALCOHOLS, GLYCOLS

Acrylonitrile-Styrene copolymer dispersion in  
 Polyether polyol  
 Alcoholic beverages  
 Alcohol polyethoxylates  
 Alcohol polyethoxylates, secondary  
 Alcohols (C13 and above)  
 Amyl alcohol  
 Behenyl alcohol  
 Brake fluid base mixtures  
 Butyl alcohol<sup>2</sup>  
 Butylene glycol<sup>2</sup>  
 Cetyl-stearyl alcohol  
 Choline chloride solutions  
 Cyclohexanol  
 Decyl alcohol<sup>2</sup>

Diacetone alcohol<sup>2</sup>  
 Diisobutylcarbinol  
 2,2-Dimethylpropane-1,3-diol  
 Dodecanol  
 Dodecyl alcohol  
 Ethoxylated alcohols, C11-C15  
 2-Ethoxyethanol  
 Ethyl alcohol<sup>2</sup>  
 Ethyl butanol  
 Ethylene chlorohydrin  
 Ethylene cyanohydrin  
 Ethylene glycol<sup>2</sup>  
 2-Ethylhexanol  
 Furfuryl alcohol<sup>2</sup>  
 Glycerine<sup>2</sup>  
 Glycerine, dioxanedimethanol mixture  
 Glycerol monooleate  
 Heptanol  
 Hexamethylene glycol  
 Hexanol  
 Hexylene glycol  
 Hydroxy terminated polybutadiene  
 Lauryl polyglucose (50% or less)  
 3-Methoxy-1-butanol  
 Methyl alcohol<sup>2</sup>  
 Methyl amyl alcohol  
 Methyl butenol  
 Methylbutynol  
 2-Methyl-2-hydroxy-3-butyne  
 Methyl isobutyl carbinol  
 3-Methyl-3-methoxybutanol  
 Molasses  
 Nonyl alcohol<sup>2</sup>  
 Octanol<sup>2</sup>  
 Octyl alcohol<sup>2</sup>  
 Pentadecanol  
 Polyalkylene oxide polyol  
 Polybutadiene, hydroxyl terminated  
 Polyglycerol  
 Polyglycerine, sodium salts solution (containing  
 less than 3% sodium hydroxide)<sup>2</sup>  
 Propyl alcohol<sup>2</sup>  
 Propylene glycol<sup>2</sup>  
 Rum  
 Sorbitol solutions  
 Stearyl alcohol  
 Tallow fatty alcohol  
 Tetradecanol  
 Tridecanol  
 Trimethylol propane polyethoxylate  
 Undecanol  
 Undecyl alcohol

## 21. PHENOLS, CRESOLS

Benzyl alcohol



Carbolic oil  
 Creosote<sup>2</sup>  
 Cresols  
 Cresylic acid  
 Cresylic acid dephenolized  
 Cresylic acid, tar  
 2,4-Dichlorophenol  
 Dodecyl phenol  
 o-Ethyl phenol  
 Long chain alkylphenate/phenol sulfide mixture  
 Nonylphenol  
 Octyl phenol  
 Phenol  
 Xylenols

## 22. CAPROLACTAM SOLUTIONS

Caprolactam solution

## 23-29. UNASSIGNED

## 30. OLEFINS

Amylene  
 Aryl polyolefin (C11-C50)  
 Butadiene  
 Butadiene, Butylene mixtures (cont. Acetylenes)  
 Butene  
 Butene oligomer  
 Butylene  
 1,5,9-Cyclododecatriene  
 1,3-Cyclopentadiene dimer  
 Cyclopentene  
 Decene  
 Dicyclopentadiene  
 Diisobutylene  
 Dipentene  
 Dodecene  
 Ethylene  
 Ethylene-propylene copolymer  
 Ethylidene norbornene<sup>2</sup>  
 1-Heptene  
 Hexene  
 Isoprene  
 Latex (ammonia (1% or less) inhibited)  
 Methyl acetylene, propadiene mixture  
 Methylcyclopentadiene dimer  
 2-Methyl-1-pentene  
 4-Methyl-1-pentene  
 alpha-Methyl styrene  
 Myrcene  
 Nonene  
 1-Octadecene  
 Octene  
 Olefin mixtures  
 alpha-Olefins (C6 - C18) mixtures

alpha-Olefins (C13 and above)  
 1,3-Pentadiene  
 Pentene  
 Pentene, Miscellaneous hydrocarbon mixture<sup>2</sup>  
 alpha-Pinene  
 beta-Pinene  
 Polybutene  
 Poly(4+)isobutylene  
 Polyolefin (molecular weight 300+)  
 Polypropylene  
 Poly(5+)propylene  
 Propylene  
 Propylene butylene polymer  
 Propylene dimer  
 Propylene tetramer  
 Propylene trimer  
 Styrene  
 Tetradecene  
 Tridecene  
 Triisobutylene  
 Tripropylene  
 Turpentine  
 Undecene

## 31. PARAFFINS

Alkanes (C6-C9)  
 n-Alkanes (C10+)  
 iso- & cyclo- Alkanes (C10-C11)  
 iso- & cyclo- Alkanes (C12+)  
 Butane  
 Cycloheptane  
 Cyclohexane  
 Cyclopentane  
 Decane  
 Dodecane  
 Ethane  
 Ethyl cyclohexane  
 Heptane  
 Hexane<sup>2</sup>  
 Methane  
 Methylcyclohexane  
 2-Methyl pentane  
 Nonane  
 Octane  
 Pentane  
 Propane  
 iso-Propylcyclohexane  
 Tridecane  
 Waxes: Paraffin

## 32. AROMATIC HYDROCARBONS

Alkyl (C3-C4) benzenes  
 Alkyl (C5-C8) benzenes  
 Alkyl (C9+) benzenes

Alkyl acrylate-Vinyl pyridine copolymer in  
 Toluene  
 Alkylbenzene, alkylindane, alkylindene mixture  
 (each C12-C17)  
 Benzene  
 Benzene, Hydrocarbon mixture (10% benzene  
 or more)  
 Benzene, Toluene, Xylene mixture  
 Butylbenzene  
 Butyl phenol, Formaldehyde resin in Xylene  
 Butyl toluene  
 Cumene  
 Cymene  
 Decylbenzene  
 Dialkyl(C10 - C14) benzenes  
 Diethylbenzene  
 Diisopropylbenzene  
 Diisopropyl naphthalene  
 Diphenyl  
 Dodecylbenzene  
 Dodecylxylene  
 Ethyl benzene  
 Ethyl toluene  
 Isopropylbenzene  
 Methyl naphthalene  
 Naphthalene  
 1-Phenyl-1-xylyl ethane  
 Poly(2+)cyclic aromatics  
 Propylbenzene  
 Pseudocumene  
 Tetradecylbenzene  
 Tetrahydronaphthalene  
 1,2,3,5-Tetramethylbenzene  
 Toluene  
 Tridecylbenzene  
 Triethylbenzene  
 Trimethylbenzene  
 Undecylbenzene  
 Xylene

### 33. MISCELLANEOUS HYDROCARBON MIXTURES

Alachlor technical  
 Alkylbenzenesulfonic acid, sodium salt solutions  
 Alkyl dithiothiadiazole (C6-C24)  
 Asphalt blending stocks: roofers flux  
 Asphalt blending stocks: straight run residue  
 Aviation alkylates  
 Calcium sulfonate, Calcium carbonate,  
 Hydrocarbon solvent mixture  
 Coal tar  
 Coal tar pitch  
 Decahydronaphthalene  
 Diphenyl, Diphenyl ether  
 Distillates: flashed feed stocks

Distillates: straight run  
 Drilling mud (low toxicity) (if flammable or  
 combustible)  
 Gas oil: cracked  
 Gasoline blending stocks: alkylates  
 Gasoline blending stocks: reformates  
 Gasolines:  
 Automotive (not over 4.23 grams lead per  
 gal.)  
 Aviation (not over 4.86 grams lead per gal.)  
 Casinghead (natural)  
 Polymer  
 Straight run  
 Jet Fuels:  
 JP-4  
 JP-5  
 JP-8  
 Kerosene  
 Mineral spirits  
 Naphtha:  
 Coal tar solvent  
 Petroleum  
 Solvent  
 Stoddard solvent  
 Varnish Makers' and Painters'  
 Oil, fuel:  
 No. 1  
 No. 1-D  
 No. 2  
 No. 2-D  
 No. 4  
 No. 5  
 No. 6  
 Oil, misc:  
 Aliphatic  
 Aromatic  
 Clarified  
 Coal  
 Crude  
 Diesel  
 Gas, high pour  
 Heartcut distillate  
 Linseed  
 Lubricating  
 Mineral  
 Mineral seal  
 Motor  
 Neatsfoot  
 Penetrating  
 Pine  
 Rosin  
 Sperm  
 Spindle  
 Turbine  
 Residual  
 Road

Transformer  
 Oxyalkylated alkyl phenol formaldehyde  
 Petrolatum  
 Pine oil  
 Sodium petroleum sulfonate  
 Sulfohydrocarbon (C3-C88)  
 Waxes: Petroleum  
 White Spirit (low(15-20%) aromatic)

### 34. ESTERS

Alkane (C14-C17) sulfonic acid, sodium salt solution  
 Alkyl(C8+)amine, Alkenyl (C12+) acid ester mixture  
 Alkyl ester copolymer (C6-C18)  
 Alkyl (C7-C9) nitrates<sup>2</sup>  
 Alkyl phenol sulfide (C8-C40)  
 Amyl acetate  
 Animal and fish oils, n.o.s.  
 Animal and fish acid oils and distillates, n.o.s.  
 Barium long chain alkaryl sulfonate (C11-C50)  
 Barium long chain alkyl (C8-C14) phenate sulfide  
 Benzene tricarboxylic acid, trioctyl ester  
 Benzylacetate  
 Butyl acetate  
 Butyl benzyl phthalate  
 n-Butyl butyrate  
 Butyl formate  
 iso-Butyl isobutyrate  
 n-Butyl propionate  
 Calcium alkyl(C9)phenol sulfide, polyolefin phosphorosulfide mixture  
 Calcium long chain alkaryl sulfonate (C11-C50)  
 Calcium long chain alkyl phenate (C8-C40)  
 Calcium long chain alkyl phenate sulfide (C8-C40)  
 Calcium long chain alkyl salicylate (C13+)  
 Calcium nitrate, Magnesium nitrate, Potassium chloride solution  
 Cobalt naphthenate in solvent naphtha  
 Coconut oil, fatty acid  
 Cottonseed oil, fatty acid  
 Cyclohexyl acetate  
 Decyl acetate  
 Dialkyl(C7 - C13) phthalates  
 Dibutyl hydrogen phosphonate  
 Dibutyl phthalate  
 Diethylene glycol butyl ether acetate  
 Diethylene glycol ethyl ether acetate  
 Diethylene glycol methyl ether acetate  
 Diethylene glycol phthalate  
 Di-(2-ethylhexyl)adipate  
 Di-(2-ethylhexyl)phthalate  
 Diethyl phthalate

Diethyl sulfate  
 Diheptyl phthalate  
 Dihexyl phthalate  
 Di-n-hexyl adipate  
 Diisobutyl phthalate  
 Diisodecyl phthalate  
 Diisononyl adipate  
 Diisononyl phthalate  
 Diisooctyl phthalate  
 Dimethyl adipate  
 Dimethylcyclicsiloxane hydrolyzate  
 Dimethyl glutarate  
 Dimethyl hydrogen phosphite<sup>2</sup>  
 Dimethyl naphthalene sulfonic acid, sodium salt solution<sup>2</sup>  
 Dimethyl phthalate  
 Dimethylpolysiloxane  
 Dimethyl succinate  
 Dinonyl phthalate  
 Dioctyl phthalate  
 Dipropylene glycol dibenzoate  
 Ditridecyl phthalate  
 2-Dodecenylsuccinic acid, dipotassium salt solution  
 Diundecyl phthalate  
 2-Ethoxyethyl acetate  
 Ethyl acetate  
 Ethyl acetoacetate  
 Ethyl butyrate  
 Ethylene carbonate  
 Ethylene glycol acetate  
 Ethylene glycol butyl ether acetate  
 Ethylene glycol diacetate  
 Ethylene glycol ethyl ether acetate  
 Ethylene glycol methyl ether acetate  
 Ethyl-3-ethoxypropionate  
 Ethyl hexyl phthalate  
 Ethyl propionate  
 Fatty acids (saturated, C13+)  
 Glycerol polyalkoxylate  
 Glyceryl triacetate  
 Glycidyl ester of C10 trialkyl acetic acid  
 Glycidyl ester of tridecylacetic acid  
 Heptyl acetate  
 Hexyl acetate  
 Lauric acid  
 Lecithin (soyabean)  
 Magnesium long chain alkaryl sulfonate (C11-C50)  
 Magnesium long chain alkyl phenate sulfide (C8-C20)  
 Magnesium long chain alkyl salicylate (C11+)  
 3-Methoxybutyl acetate  
 1-Methoxy-2-propyl acetate  
 Methyl acetate  
 Methyl acetoacetate

Methyl amyl acetate  
 Methyl butyrate  
 Methyl formate  
 3-Methyl-3-methoxybutyl acetate  
 Methyl salicylate  
 Metolachlor  
 Naphthalene sulfonic acid, sodium salt solution  
 (40% or less)  
 Nonyl acetate  
 n-Octyl acetate  
 Octyl decyl adipate  
 Oil, edible:  
   Beechnut  
   Castor  
   Cocoa butter  
   Coconut<sup>2</sup>  
   Cod liver  
   Corn  
   Cottonseed  
   Fish<sup>2</sup>  
   Groundnut  
   Hazelnut  
   Lard  
   Lanolin  
   Nutmeg butter  
   Olive  
   Palm<sup>2</sup>  
   Palm kernel  
   Peanut  
   Poppy  
   Poppy seed  
   Raisin seed  
   Rapeseed  
   Rice bran  
   Safflower  
   Salad  
   Sesame  
   Soya bean  
   Sunflower  
   Sunflower seed  
   Tucum  
   Vegetable  
   Walnut  
 Oil, misc.:  
   Animal  
   Coconut oil, fatty acid methyl ester  
   Cotton seed oil, fatty acid  
   Lanolin  
   Palm kernel oil, fatty acid methyl ester  
   Palm oil, methyl ester  
   Pilchard  
   Perilla  
   Soapstock  
   Soyabean (epoxidized)  
   Tall  
   Tall, fatty acid<sup>2</sup>

Tung  
 Olefin/alkyl ester copolymer (molecular weight  
 2000+)  
 Oleic acid  
 Palm kernel acid oil  
 Palm kernel acid oil, methyl ester  
 Palm stearin  
 n-Pentyl propionate  
 Poly(2-8)alkylene glycol monoalkyl(C1-C6) ether  
 acetate  
 Polydimethylsiloxane  
 Polyferric sulfate solution  
 Polymethylsiloxane  
 Poly(20)oxyethylene sorbitan monooleate  
 Polysiloxane  
 Polyolefin amide alkeneamine borate (C28-  
 C250)  
 Polyolefin ester (C28-C250)  
 Polyolefin phosphorosulfide, barium derivative  
 (C28-C250)  
 Potassium oleate  
 Propyl acetate  
 Propylene carbonate  
 Propylene glycol methyl ether acetate  
 Sodium acetate, glycol, water mixture (not  
 containing sodium hydroxide)<sup>2</sup>  
 Sodium acetate solution  
 Sodium benzoate solution  
 Sodium dimethyl naphthalene sulfonate solution<sup>2</sup>  
 Sodium long chain alkyl salicylate (C13+)  
 Sodium naphthalene sulfonate solution  
 Soyabean oil (epoxidized)  
 Stearic acid  
 Tall oil  
 Tallow<sup>2</sup>  
 Tallow fatty acid<sup>2</sup>  
 Tributyl phosphate  
 Tricresyl phosphate  
 Tridecanoic acid  
 Tridecyl acetate  
 Triethylene glycol di-(2-ethylbutyrate)  
 Triethyl phosphate  
 Triethyl phosphite<sup>2</sup>  
 Triisooctyl trimellitate<sup>2</sup>  
 Triisopropylated phenyl phosphates  
 2,2,4-Trimethyl-1,3-pentanediol diisobutyrate  
 2,2,4-Trimethyl-1,3-pentanediol-1-isobutyrate  
 2,2,4-Trimethyl-3-pentanol-1-isobutyrate  
 Trimethyl phosphite<sup>2</sup>  
 Trisodium nitrilotriacetate  
 Trixylyl phosphate  
 Trixylenyl phosphate  
 Vegetable acid oils and distillates, n.o.s.  
 Vegetable oils, n.o.s.  
 Waxes: Carnauba  
 Zinc alkaryl dithiophosphate (C7-C16)

Zinc alkyl dithiophosphate (C3-C14)

### 35. VINYL HALIDES

Vinyl chloride  
Vinylidene chloride

### 36. HALOGENATED HYDROCARBONS

Benzyl chloride  
Carbon tetrachloride  
Chlorinated paraffins (C10 - C13)  
Chlorinated paraffins (C14 - C17)  
Chlorobenzene  
Chlorodifluoromethane  
Chloroform  
Chlorotoluene  
Dichlorobenzene  
Dichlorodifluoromethane  
1,1-Dichloroethane  
1,6-Dichlorohexane  
2,2'-Dichloroisopropyl ether  
Dichloromethane  
Dichloropropane  
Ethyl chloride  
Ethylene dibromide  
Ethylene dichloride<sup>2</sup>  
Methyl bromide  
Methyl chloride  
Monochlorodifluoromethane  
n-Propyl chloride  
Pentachloroethane  
Perchloroethylene  
1,1,2,2-Tetrachloroethane  
1,2,4-Trichlorobenzene  
1,1,1-Trichloroethane<sup>2</sup>  
1,1,2-Trichloroethane  
Trichloroethylene<sup>2</sup>  
1,2,3-Trichloropropane  
1,1,2-trichloro-1,2,2-trifluoroethane

### 37. NITRILES

Acetonitrile  
Adiponitrile  
Lactonitrile solution  
Propionitrile  
Tallow nitrile

### 38. CARBON DISULFIDE

Carbon disulfide

### 39. SULFOLANE

Sulfolane

### 40. GLYCOL ETHERS

Diethylene glycol<sup>2</sup>  
Diethylene glycol butyl ether  
Diethylene glycol dibutyl ether  
Diethylene glycol diethyl ether  
Diethylene glycol ethyl ether  
Diethylene glycol methyl ether  
Diethylene glycol n-hexyl ether  
Diethylene glycol phenyl ether  
Diethylene glycol propyl ether  
Dipropylene glycol  
Dipropylene glycol butyl ether  
Dipropylene glycol methyl ether  
Ethoxy triglycol  
Ethylene glycol hexyl ether  
Ethylene glycol methyl butyl ether  
Ethylene glycol monoalkyl ethers  
Ethylene glycol tert-butyl ether  
Ethylene glycol butyl ether  
Ethylene glycol dibutyl ether  
Ethylene glycol ethyl ether  
Ethylene glycol isopropyl ether  
Ethylene glycol methyl ether  
Ethylene glycol phenyl ether  
Ethylene glycol phenyl ether, Diethylene glycol phenyl ether mixture  
Ethylene glycol propyl ether  
Hexaethylene glycol  
Methoxy triglycol  
Nonyl phenol (ethoxylated)  
Nonyl phenol poly(4-12)ethoxylates  
Polyalkylene glycol butyl ether  
Polyalkylene glycols, Polyalkylene glycol monoalkyl ethers mixtures  
Polyethylene glycols  
Polyethylene glycol dimethyl ether  
Poly(2-8)alkylene glycol monoalkyl(C1-C6) ether  
Polyethylene glycol monoalkyl ether  
Polypropylene glycols  
Polypropylene glycol methyl ether  
n-Propoxypropanol  
Propylene glycol monoalkyl ether  
Propylene glycol ethyl ether  
Propylene glycol methyl ether  
Propylene glycol n-butyl ether  
Propylene glycol phenyl ether  
Propylene glycol propyl ether  
Tetraethylene glycol  
Triethylene glycol  
Triethylene glycol butyl ether  
Triethylene glycol butyl ether mixture  
Triethylene glycol ether mixture  
Triethylene glycol ethyl ether  
Triethylene glycol methyl ether

Tripropylene glycol  
Tripropylene glycol methyl ether

#### 41. ETHERS

Alkaryl polyether (C9-C20)  
Butyl ether  
2,2-Dichloroethyl ether  
Diethyl ether  
Diglycidyl ether of Bisphenol F  
Diglycidyl ether of bisphenol A  
Dimethyl furan  
1,4-Dioxane  
Diphenyl ether  
Diphenyl ether, Diphenyl phenyl ether mixture  
Ethyl ether  
Long chain alkaryl polyether (C11-C20)  
Methyl tert-butyl ether<sup>2</sup>  
Propyl ether  
Tetrahydrofuran  
1,3,5-Trioxane  
Polyether (molecular weight 2000+)

#### 42. NITROCOMPOUNDS

o-Chloronitrobenzene  
Dinitrotoluene  
Nitrobenzene  
Nitroethane  
Nitropropane  
Nitropropane, Nitroethane mixture  
Nitrotoluene

#### 43. MISCELLANEOUS WATER SOLUTIONS

Aluminum sulfate solution<sup>2</sup>  
2-Amino-2-hydroxymethyl-1,3-propanediol  
solution  
Ammonium bisulfite solution<sup>2</sup>  
Ammonium nitrate-urea solution (not containing  
ammonia)  
Ammonium polyphosphate solution  
Ammonium sulfate solution  
Ammonium thiosulfate solution  
Sulfonated polyacrylate solutions<sup>2</sup>  
Calcium bromide solution  
Calcium chloride solution  
Clay slurry  
Corn syrup  
Dextrose solution  
2,4-Dichlorophenoxyacetic acid, Diethanolamine  
salt solution  
2,4-Dichlorophenoxyacetic acid,  
Triisopropanolamine salt solution<sup>2</sup>  
Diethanolamine salt of 2,4-  
Dichlorophenoxyacetic acid solution

Diethylenetriamine pentaacetic acid,  
pentasodium salt solution  
Dodecyl diphenyl ether disulfonate solution  
Drilling brine (containing Calcium, Potassium or  
Sodium salts)  
Drilling brine (containing Zinc salts)  
Drilling mud (low toxicity) (if non-flammable or  
non-combustible)  
Ethylenediaminetetracetic acid, tetrasodium salt  
solution  
Ethylene, Vinyl acetate copolymer emulsion  
Ferric hydroxyethylethylenediaminetriacetic acid,  
trisodium salt solution<sup>2</sup>  
Fish solubles (water based fish meal extracts)  
Fructose solution  
Fumaric adduct of Rosin, water dispersion  
Hexamethylenediamine adipate solution  
N-(Hydroxyethyl)ethylenediaminetriacetic acid,  
trisodium salt solution  
Kaolin clay slurry  
Latex, liquid synthetic  
Lignin liquor  
Liquid streptomyces solubles  
N-Methylglucamine solution  
N-Methylglucamine solution (70% or less)  
Naphthenic acid, sodium salt solution  
Potassium chloride solution  
Potassium thiosulfate solution  
Rosin soap (disproportionated) solution  
Sewage sludge, treated  
Sodium alkyl sulfonate solution  
Sodium hydrogen sulfite solution  
Sodium polyacrylate solution<sup>2</sup>  
Sodium salt of Ferric  
hydroxyethylethylenediamine triacetic acid  
solution  
Sodium silicate solution<sup>2</sup>  
Sodium sulfide solution  
Sodium sulfite solution  
Sodium tartrates, Sodium succinates solution  
Sulfonated polyacrylate solutions<sup>2</sup>  
Tall oil soap (disproportionated) solution  
Tetrasodium salt of EDTA solution  
Triisopropanolamine salt of 2,4-  
Dichlorophenoxyacetic acid solution  
Urea, Ammonium nitrate solution (not containing  
Ammonia)  
Urea, Ammonium phosphate solution  
Urea solution  
Vegetable protein solution (hydrolysed)  
Water

## FOOTNOTES TO TABLE

<sup>1</sup> Because of very high reactivity or unusual conditions of carriage or potential compatibility problems, this product is not assigned to a specific group in the Compatibility Chart. For additional compatibility information, contact Commandant (G-MTH), U.S. Coast Guard, 2100 Second Street, SW., Washington, DC 20593-0001. Telephone (202) 267-1577.

<sup>2</sup> See Table 7.3 - Exceptions to the Chart.

**TABLE 7.3**  
**EXCEPTIONS TO THE CHART**

1. The binary combinations listed below have been tested as prescribed in Appendix III and found not to be dangerously reactive. These combinations are exceptions to the Compatibility Chart (Figure 1) and may be stowed in adjacent tanks.

Member of Reactive Group	Compatible with		
Acetone (18)	Diethylenetriamine (7)	Tetradecylamine mixture (7)	Butyl alcohol (20)
Acetone cyanohydrin (0)	Acetic acid (4)	Ethylenediamine (7)	tert-Butyl alcohol (20)
Acrylonitrile (15)	Triethanolamine (8)		Butylene glycol (20)
1,3-Butylene glycol (20)	Morpholine (7)		Creosote (21)
1,4-Butylene glycol (20)	Ethylamine (7)		Diethylene glycol (40)
	Triethanolamine (8)		Ethyl alcohol (20)
Gamma-Butyrolactone(0)	N-Methyl-2-pyrrolidone (9)		Ethylene glycol (20)
Caustic potash, 50% or less (5)	Isobutyl alcohol (20)		Ethyl hexanol (20)
	Ethyl alcohol (20)		Glycerine (20)
	Ethylene glycol (20)		Isononyl alcohol (20)
	Isopropyl alcohol (20)		Isophorone (18)
	Methyl alcohol (20)		Methyl butyl ketone (18)
	iso-Octyl alcohol (20)		Methyl isobutyl ketone (18)
Caustic soda, 50% or less (5)	Butyl alcohol (20)		Methyl ethyl ketone (18)
	tert-Butyl alcohol, Methanol mixtures		Propyl alcohol (20)
	Decyl alcohol (20)		Propylene glycol (20)
	Iso-Decyl alcohol	Oleum (0)	Hexane (31)
	Diacetone alcohol (20)		Dichloromethane (36)
	Diethylene glycol (40)		Perchloroethylene (36)
	Ethyl alcohol (40%, whiskey) (20)	1,2-Propylene glycol (20)	Diethylenetriamine (7)
	Ethylene glycol (20)		Polyethylene polyamines (7)
	Ethylene glycol, Diethylene glycol mixture (20)		Triethylenetetramine (7)
	Ethyl hexanol (Octyl alcohol) (20)	Sodium dichromate, 70% (0)	Methyl alcohol (20)
	Methyl alcohol (20)	Sodium hydrosulfide solution (5)	Iso-Propyl alcohol (20)
	Nonyl alcohol (20)	Sulfuric acid (2)	Coconut oil (34)
	iso-Nonyl alcohol (20)		Coconut oil acid (34)
	Propyl alcohol (20)		Palm oil (34)
	Propylene glycol (20)		Tallow (34)
	Sodium chlorate (0)	Sulfuric acid, 98% or less (2)	Choice white grease tallow (34)
	iso-Tridecanol (20)		
Dodecyl and	Tall oil, fatty acid (34)		



2. The binary combinations listed below have been determined to be dangerously reactive, based on either data obtained in the literature or on laboratory testing which has been carried out in accordance with procedures prescribed in Appendix III. These combinations are exceptions to the Compatibility Chart (Figure 1) and may not be stowed in adjacent tanks.

Acetone cyanohydrin (0) is not compatible with Groups 1-12, 16, 17 and 22.

Acrolein (19) is not compatible with Group 1, Non-Oxidizing Mineral Acids.

Acrylic acid (4) is not compatible with Group 9, Aromatic Amines.

Acrylonitrile (15) is not compatible with Group 5 (Caustics)

Alkylbenzenesulfonic acid (0) is not compatible with Groups 1-3, 5-9, 15, 16, 18, 19, 30, 34, 37, and strong oxidizers.

Allyl alcohol (15) is not compatible with Group 12, Isocyanates.

Alkyl (C7-C9) nitrates (34) is not compatible with Group 1, Non-oxidizing Mineral Acids.

Aluminum sulfate solution (43) is not compatible with Groups 5-11.

Ammonium bisulfite solution (43) is not compatible with Groups 1, 3, 4, and 5.

Benzenesulfonyl chloride (0) is not compatible with Groups 5-7, and 43.

1,4-Butylene glycol (20) is not compatible with Groups 1-9.

gamma-Butyrolactone (0) is not compatible with Groups 1-9.

Caustic soda solution, 50% or less (5) is not compatible with 1,4-Butylene glycol (20).

Crotonaldehyde (19) is not compatible with Group 1, Non-Oxidizing Mineral Acids.

Cyclohexanone, Cyclohexanol mixture (18) is not compatible with Group 12, Isocyanates.

2,4-Dichlorophenoxyacetic acid, Triisopropanolamine salt solution (43) is not compatible with Group 3, Nitric acid.

2,4-Dichlorophenoxyacetic acid, Dimethylamine salt solution (0) is not compatible with Groups 1-5, 11, 12, and 16.

Dimethyl hydrogen phosphite (34) is not compatible with Groups 1 and 4.

Dimethyl naphthalene sulfonic acid, sodium salt solution (34) is not compatible with Group 12, Formaldehyde, and strong oxidizing agents.

Dodecylbenzenesulfonic acid (0) is not compatible with oxidizing agents and Groups 1, 2, 3, 5, 6, 7, 8, 9, 15, 16, 18, 19, 30, 34, and 37.

Ethylenediamine (7) is not compatible with Ethylene dichloride (36).

Ethylene dichloride (36) is not compatible with Ethylenediamine (7).

Ethylidene norbornene (30) is not compatible with Groups 1-3 and 5-8.

2-Ethyl-3-propylacrolein (19) is not compatible with Group 1, Non-Oxidizing Mineral Acids.

Ferric hydroxyethylethylenediamine triacetic acid, Sodium salt solution (43) is not compatible with Group 3, Nitric acid.

Fish oil (34) is not compatible with Sulfuric acid (2).

Formaldehyde (over 50%) in Methyl alcohol (over 30%) (19) is not compatible with Group 12, Isocyanates.

Formic acid (4) is not compatible with Furfural alcohol (20).

Furfuryl alcohol (20) is not compatible with Group 1, Non-Oxidizing Mineral Acids and Formic acid (4).

2-Hydroxyethyl acrylate is not compatible with Groups 2, 3, 5-8 and 12.

Isophorone (18) is not compatible with Group 8, Alkanolamines.

Magnesium chloride solution (0) is not compatible with Groups 2, 3, 5, 6 and 12.

Mesityl oxide (18) is not compatible with Group 8, Alkanolamines.

Methacrylonitrile (15) is not compatible with Group 5 (Caustics).

Methyl tert-butyl ether (41) is not compatible with Group 1, Non-oxidizing Mineral Acids.

Naphtha, cracking fraction (33) is not compatible with strong acids, caustics or oxidizing agents.

o-Nitrophenol (0) is not compatible with Groups 2, 3, and 5-10.

Octyl nitrates (all isomers) see Alkyl (C7-C9) nitrates.

Oleum (0) is not compatible with Sulfuric acid (2) and 1,1,1-Trichloroethane (36).

Phthalate based polyester polyol (0) is not compatible with group 2, 3, 5, 7 and 12.

Pentene, Miscellaneous hydrocarbon mixtures (30) are not compatible with strong acids or oxidizing agents.

Polyglycerine, Sodium salts solution (20) is not compatible with Groups 1, 4, 11, 16, 17, 19, 21, and 22.

Sodium acetate, Glycol, Water mixture (1% or less Sodium hydroxide) (34) is not compatible with Group 12 (Isocyanates).

Sodium chlorate solution (50% or less) (0) is not compatible with Groups 1-3, 5, 7, 8, 10, 12, 13, 17, and 20.

Sodium dichromate solution (70% or less) (0) is not compatible with Groups 1-3, 5, 7, 8, 10, 12, 13, 17, and 20.

Sodium dimethyl naphthalene sulfonate solution (34) is not compatible with Group 12, Formaldehyde and strong oxidizing agents.

Sodium hydrogen sulfide, Sodium carbonate solution (0) is not compatible with Groups 6 (Ammonia) and 7 (Aliphatic amines).

Sodium hydrosulfide (5) is not compatible with Groups 6 (Ammonia) and 7 (Aliphatic amines).

Sodium hydrosulfide, Ammonium sulfide solution (5) is not compatible with Groups 6 (Ammonia) and 7 (Aliphatic amines).

Sodium polyacrylate solution (43) is not compatible with Group 3, Nitric Acid.

Sodium salt of Ferric hydroxyethylethylenediamine triacetic acid solution (43) is not compatible with Group 3, Nitric acid.

Sodium silicate solution (43) is not compatible with Group 3, Nitric acid.

Sodium sulfide, hydrosulfide solution (0) is not compatible with Groups 6 (Ammonia) and 7 (Aliphatic amines).

Sodium thiocyanate (56% or less) (0) is not compatible with Groups 1-4.

Sulfonated polyacrylate solution (43) is not compatible with Group 5 (Caustics).

Sulfuric acid (2) is not compatible with Fish oil (34), or Oleum (0).

Tallow fatty acid (34) is not compatible with Group 5, Caustics.

1,1,1-Trichloroethane (36) is not compatible with Oleum (0).

Trichlorethylene (36) is not compatible with Group 5, Caustics.

Triethyl phosphite (34) is not compatible with Groups 1 and 4.

Trimethyl phosphite (34) is not compatible with Groups 1 and 4.

1,3,5-Trioxane (41) is not compatible with Group 1 (Non-oxidizing mineral acids) and Group 4 (Organic acids).

## 8. INDEX OF SYNONYMS

SYNONYM	COMPOUND NAMES
300° oil	= Oils, miscellaneous: mineral seal
Aatrex herbicide	= Atrazine
Absorbent oil	= Oils, miscellaneous: absorption
Accelerator HX	= N-Ethylcyclohexylamine
Acetal	= Acetal
Acetaldehyde diethylacetal	= Acetal
Acetaldehyde, chloro-	= Chloroacetaldehyde
Acetaldehyde, trichloro	= Trichloroacetaldehyde
Acetaldehyde	= Acetaldehyde
p-Acetaldehyde	= Paraldehyde
Acetate C-7	= Heptyl acetate
Acetate C-9	= Nonyl acetate
Bis (Acetate) dioxouranium	= Uranyl acetate
(Acetato-o) phenyl mercury	= Phenylmercuric acetate
Acetatophenylmercury	= Phenylmercuric acetate
Acetic acid anhydride	= Acetic anhydride
Acetic acid n-amyl ester	= Amyl acetate (all isomers)
Acetic acid, 3-methoxybutyl ester	= 3-Methoxybutyl acetate
Acetic acid, ammonium salt	= Ammonium acetate
Acetic acid, benzyl ester	= Benzyl acetate
Acetic acid, chromium salt	= Chromic acetate
Acetic acid, cupric salt	= Copper acetate
Acetic acid, cyclohexyl ester	= Cyclohexyl acetate
Acetic acid, dimethylamide	= Dimethylacetamide
Acetic acid, dimethylamide	= N,N-Dimethyl acetamide solution (40% or less)
Acetic acid, ethyl ester	= Ethyl acetate
Acetic acid, fluoro-, sodium salt	= Sodium fluoroacetate
Acetic acid, heptyl ester	= Heptyl acetate
Acetic acid, hexyl ester	= Hexyl acetate
Acetic acid, isobutyl ester	= Isobutyl acetate
Acetic acid, isopropyl ester	= Isopropyl acetate
Acetic acid, methyl ester	= Methyl acetate
Acetic acid, n-butyl ester	= n-Butyl acetate
Acetic acid, n-nonyl ester	= Nonyl acetate
Acetic acid, n-propyl ether	= n-Propyl acetate
Acetic acid, nickel (II) salt	= Nickel acetate
Acetic acid, phenylmethyl ester	= Benzyl acetate
Acetic acid, sec-butyl ester	= sec-Butyl acetate
Acetic acid, tert-butyl ester	= tert-Butyl acetate
Acetic acid, thallium (I) salt	= Thallium acetate
Acetic acid, thallous salt	= Thallium acetate
Acetic acid, zinc salt	= Zinc acetate
Acetic acid	= Acetic acid
Acetic aldehyde	= Acetaldehyde
Acetic anhydride	= Acetic anhydride
Acetic ester	= Ethyl acetate
Acetic ether	= Ethyl acetate
Acetoacetic acid, ethyl ester	= Ethyl acetoacetate
Acetoacetic acid, methyl ester	= Methyl acetoacetate
Acetoacetic ester	= Ethyl acetoacetate

SYNONYM	COMPOUND NAMES
Acetocyanohydrin	= Lactonitrile solution (80% or less)
Acetone cyanohydrin	= Acetone cyanohydrin
Acetone	= Acetone
Acetonitrile	= Acetonitrile
Acetonyl bromide	= Bromoacetone
Acetophenone	= Acetophenone
alpha-Acetoxytoluene	= Benzyl acetate
Acetyl bromide	= Acetyl bromide
Acetyl chloride	= Acetyl chloride
Acetyl hydroperoxide	= Peracetic acid
Acetyl oxide	= Acetic anhydride
Acetyl peroxide solution	= Acetyl peroxide solution
Acetylacetone	= Acetylacetone
Acetylbenzene	= Acetophenone
Acetylene dichloride	= 1,2-Dichloroethylene
Acetylene tetrachloride	= Tetrachloroethane
Acetylene	= Acetylene
Acetylenogen	= Calcium carbide
Acetylmethyl bromide	= Bromoacetone
Acid ammonium carbonate	= Ammonium bicarbonate
Acid ammonium fluoride	= Ammonium bifluoride
Acraldehyde	= Acrolein
Acridine	= Acridine
Acrolein	= Acrolein
Acrylaldehyde	= Acrolein
Acrylamide solution	= Acrylamide solution
Acrylic acid amide (50%)	= Acrylamide solution
Acrylic acid, 2-ethylhexylester	= 2-Ethylhexyl acrylate
Acrylic acid, decyl ester	= n-Decyl acrylate
Acrylic acid, ethyl ester	= Ethyl acrylate
Acrylic acid, isobutyl ester	= iso-butyl acrylate
Acrylic acid, methyl ester	= Methyl acrylate
Acrylic acid, n-butyl ester	= n-Butyl acrylate
Acrylic acid	= Acrylic acid
Acrylic aldehyde	= Acrolein
Acrylic amide 50%	= Acrylamide solution
Acrylonitrile	= Acrylonitrile
Activated charcoal	= Charcoal
Adacene-12	= 1-Dodecene
Adipic acid, bis (2-ethylhexyl) ester	= Di-(2-ethylhexyl) adipate
Adipic acid, bis (2-ethylhexyl) ester	= Dioctyl adipate
Adipic acid, dimethyl ester	= Dimethyl adipate
Adipic acid	= Adipic acid
Adipinic acid	= Adipic acid
Adipol 2EH	= Dioctyl adipate
Adiponitrile	= Adiponitrile
Adronal	= Cyclohexanol
Aerosol surfactant	= Dioctyl sodium sulfosuccinate
Aerothene	= Trichloroethane
AIP	= Aluminum phosphide
Alaninol	= 2-Propanolamine
Albone	= Hydrogen peroxide
Albus	= Mercuric ammonium chloride
Alcohol C-10	= n-Decyl alcohol

SYNONYM	COMPOUND NAMES
Alcohol C-11 (undecylic)	= Undecanol
Alcohol C-8	= Octanol
Alcohol	= Ethyl alcohol
Aldehyde-collidine	= Methylethylpyridine
Aldehyde C-10	= Decaldehyde
Aldehydine	= Methylethylpyridine
Aldifen	= 2,4-Dinitrophenol
Aldrin	= Aldrin
Alfa-tox	= Diazinon
Alimet	= 2-Hydroxy-4-(methylthio)-butanoic acid
Alkaway liquid alkaline deruster	= Boiler compound, liquid
Alkron	= Methyl parathion
Alkyl(C <sub>11</sub> – C <sub>17</sub> )benzenesulfonic acid	= Alkyl(C <sub>11</sub> . C <sub>17</sub> )benzenesulfonic acid
Alkylbenzenesulfonic acid, sodium salt	= Sodium alkylbenzenesulfonates
Allene-methylacetylene mixture	= Methyl acetylene, propadiene mixture
Allomaleic acid	= Fumaric acid
Allyl alcohol	= Allyl alcohol
Allyl aldehyde	= Acrolein
Allyl bromide	= Allyl bromide
Allyl chloride	= Allyl chloride
Allyl chlorocarbonate	= Allyl chloroformate
Allyl chloroformate	= Allyl chloroformate
Allyl trichloride	= 1,2,3-Trichloropropane
Allylethylene	= 1,4-Pentadiene
Allylsilicone trichloride	= Allyltrichlorosilane
Allyltrichlorosilane	= Allyltrichlorosilane
alpha,alpha,alpha-trifluoro-2,6-Dinitro- n,n-dipropyl-p-toluidine	= Trifluralin
Alrowet D65	= Dioctyl sodium sulfosuccinate
Alum	= Aluminum sulfate
Aluminum chloride solution	= Aluminum chloride solution
Aluminum chloride	= Aluminum chloride
Aluminum ethyl dichloride	= Ethylaluminum dichloride
Aluminum fluoride	= Aluminum fluoride
Aluminum monophosphide	= Aluminum phosphide
Aluminum nitrate nonahydrate	= Aluminum nitrate
Aluminum nitrate	= Aluminum nitrate
Aluminum phosphide	= Aluminum phosphide
Aluminum sulfate solution	= Aluminum sulfate solution
Aluminum sulfate	= Aluminum sulfate
Aluminum triethyl	= Triethylaluminum
Aluminum triisobutyl	= Triisobutylaluminum
Amchlor	= Ammonium chloride
Amchloride	= Ammonium chloride
American palm kernel oil	= Oils, edible: tucum
3-Amino-1-methylbenzene	= m-Toluidine
2-Amino-1-methylbenzene	= o-Toluidine
4-Amino-1-methylbenzene	= p-Toluidine
2-Amino-1-propanol	= 2-Propanolamine
3-Amino-1-propanol	= n-Propanolamine
1-Amino-2-ethylhexane	= 2-Ethylhexylamine
1-Amino-2-fluorobenzene	= 2-Fluoroaniline
2-Amino-2-methyl-1-propanol (90% or less)	= 2-Amino-2-methyl-1-propanol (90% or less)

SYNONYM	COMPOUND NAMES
1-Amino-2-methylpropane	= Isobutylamine
2-Amino-2-methylpropane	= tert-Butylamine
1-Amino-2-nitrobenzene	= 2-Nitroaniline
1-Amino-2-propanol	= Monoisopropanolamine
1-Amino-4-chlorobenzene	= p-chloroaniline
1-Amino-4-fluorobenzene	= 4-Fluoroaniline
1-Amino-4-nitrobenzene	= 4-Nitroaniline
2-Amino-5-chlorotoluene	= 4-Chloro-o-toluidine
Aminobenzene	= Aniline
1-Aminobutane	= n-Butylamine
Aminocaproic lactam	= Caprolactam
Aminocyclohexane	= Cyclohexylamine
Aminodimethylbenzene	= 2,6-Dimethylaniline
2-Aminodimethylethanol	= 2-Amino-2-methyl-1-propanol (90% or less)
Aminoethane	= Ethylamine
2-Aminoethanol	= Monoethanolamine
beta-Aminoethyl alcohol	= Monoethanolamine
N-Aminoethyl piperazine	= N-Aminoethyl piperazine
Bis-(2-Aminoethyl) amine	= Diethylenetriamine
2-[(2-Aminoethyl) amino] ethanol	= Aminoethylethanolamine
N-(2-Aminoethyl) ethanolamine	= Aminoethylethanolamine
N-(2-Aminoethyl) piperazine	= N-Aminoethyl piperazine
1-(2-Aminoethyl) piperazine	= N-Aminoethyl piperazine
N,N'-bis-(2-Aminoethyl)ethylenediamine	= Triethylenetetramine
Aminoethylethanolamine	= Aminoethylethanolamine
Aminoform	= Hexamethylenetetramine
2-Aminoisobutane	= tert-Butylamine
beta-Aminoisobutanol	= 2-Amino-2-methyl-1-propanol (90% or less)
Aminomercuric chloride	= Mercuric ammonium chloride
Aminomethane	= Methylamine
Aminomethane	= Methylamine solution
3-Aminomethyl-3,5,5-trimethylcyclohexylamine	= Isophorone diamine
1-Aminonaphthalene	= 1-Naphthylamine
2-Aminopropane	= Isopropylamine
1-Aminopropane	= n-Propylamine
4-Aminopyridine	= 4-Aminopyridine
p-Aminopyridine	= 4-Aminopyridine
alpha-Aminotoluene	= Benzylamine
3-Aminotoluene	= m-Toluidine
2-Aminotoluene	= o-Toluidine
4-Aminotoluene	= p-Toluidine
Ammate	= Ammonium sulfamate
Ammoneric	= Ammonium chloride
Ammonia soap	= Ammonium oleate
Ammonia solution	= Ammonium hydroxide (<28% aqueous ammonia)
Ammonia water	= Ammonium hydroxide (<28% aqueous ammonia)
Ammonia, anhydrous	= Ammonia, anhydrous
Ammoniated mercury	= Mercuric ammonium chloride
Ammonioformaldehyde	= Hexamethylenetetramine

SYNONYM	COMPOUND NAMES
Ammonium acetate	= Ammonium acetate
Ammonium acid fluoride	= Ammonium bifluoride
Ammonium amidosulfonate	= Ammonium sulfamate
Ammonium amidosulphate	= Ammonium sulfamate
Ammonium aminoformate	= Ammonium carbamate
Ammonium benzoate	= Ammonium benzoate
Ammonium bicarbonate	= Ammonium bicarbonate
Ammonium bichromate	= Ammonium dichromate
Ammonium bifluoride	= Ammonium bifluoride
Ammonium bisulfite	= Ammonium bisulfite
Ammonium borofluoride	= Ammonium fluoborate
Ammonium bromide	= Ammonium bromide
Ammonium carbamate	= Ammonium carbamate
Ammonium carbazotate	= Ammonium picrate, wet
Ammonium carbonate	= Ammonium carbonate
Ammonium chloride	= Ammonium chloride
Ammonium chromate	= Ammonium chromate
Ammonium citrate, dibasic	= Ammonium citrate, dibasic
Ammonium citrate, dibasic	= Ammonium citrate, dibasic
Ammonium citrate	= Ammonium citrate, dibasic
Ammonium cupric sulfate	= Copper sulfate, ammoniated
Ammonium decaborate octahydrate	= Ammonium pentaborate
Ammonium dichromate	= Ammonium dichromate
Ammonium disulfatonickelate (II)	= Nickel ammonium sulfate
Ammonium ferric citrate	= Ferric ammonium citrate
Ammonium ferric oxalate trihydrate	= Ferric ammonium oxalate
Ammonium ferrous sulfate	= Ferrous ammonium sulfate
Ammonium fluoborate	= Ammonium fluoborate
Ammonium fluoride	= Ammonium fluoride
Ammonium fluorosilicate	= Ammonium silicofluoride
Ammonium formate	= Ammonium formate
Ammonium gluconate	= Ammonium gluconate
Ammonium hydrogen carbonate	= Ammonium bicarbonate
Ammonium hydrogen difluoride	= Ammonium bifluoride
Ammonium hydrogen fluoride	= Ammonium bifluoride
Ammonium hydrogen sulfide solution	= Ammonium sulfide
Ammonium hydrogen sulfite	= Ammonium bisulfite
Ammonium hydrosulfite	= Ammonium bisulfite
Ammonium hydroxide (<28% aqueous ammonia)	= Ammonium hydroxide (<28% aqueous ammonia)
Ammonium hypo solution	= Ammonium thiosulfate solution (60% or less)
Ammonium hypophosphite	= Ammonium hypophosphite
Ammonium hyposulfite solution	= Ammonium thiosulfate solution (60% or less)
Ammonium hyposulfite	= Ammonium thiosulfate
Ammonium iodide	= Ammonium iodide
Ammonium lactate syrup	= Ammonium lactate
Ammonium lactate	= Ammonium lactate
Ammonium lauryl sulfate	= Ammonium lauryl sulfate
Ammonium molybdate	= Ammonium molybdate
Ammonium monosulfite	= Ammonium bisulfite
Ammonium muriate	= Ammonium chloride
Ammonium nickel sulfate	= Nickel ammonium sulfate



SYNONYM	COMPOUND NAMES
Ammonium nitrate-phosphate mixture	= Ammonium nitrate-phosphate mixture
Ammonium nitrate-sulfate mixture	= Ammonium nitrate-sulfate mixture
Ammonium nitrate-urea solution	= Ammonium nitrate-urea solution
Ammonium nitrate	= Ammonium nitrate
Ammonium oleate	= Ammonium oleate
Ammonium oxalate hydrate	= Ammonium oxalate
Ammonium oxalate	= Ammonium oxalate
Ammonium pentaborate tetrahydrate	= Ammonium pentaborate
Ammonium pentaborate	= Ammonium pentaborate
Ammonium pentachlorozincate	= Zinc ammonium chloride
Ammonium perchlorate	= Ammonium perchlorate
Ammonium peroxydisulfate	= Ammonium persulfate
Ammonium persulfate	= Ammonium persulfate
Ammonium phosphate, dibasic	= Ammonium phosphate
Ammonium phosphate	= Ammonium phosphate
Ammonium picrate (yellow)	= Ammonium picrate, wet
Ammonium picrate, wet	= Ammonium picrate, wet
Ammonium picronitrate	= Ammonium picrate, wet
Ammonium rhodanate	= Ammonium thiocyanate
Ammonium rhodanide	= Ammonium thiocyanate
Ammonium silicofluoride	= Ammonium silicofluoride
Ammonium stearate dispersion	= Ammonium stearate
Ammonium stearate	= Ammonium stearate
Ammonium sulfamate	= Ammonium sulfamate
Ammonium sulfate	= Ammonium sulfate
Ammonium sulfhydrate solution	= Ammonium sulfide
Ammonium sulfide solution	= Ammonium sulfide
Ammonium sulfide	= Ammonium sulfide
Ammonium sulfite	= Ammonium sulfite
Ammonium sulfocyanate	= Ammonium thiocyanate
Ammonium sulfocyanide	= Ammonium thiocyanate
Ammonium tartrate	= Ammonium tartrate
Ammonium tetrafluoborate	= Ammonium fluoborate
Ammonium thiocyanate	= Ammonium thiocyanate
Ammonium thiosulfate solution (60% or less)	= Ammonium thiosulfate solution (60% or less)
Ammonium thiosulfate	= Ammonium thiosulfate
Ammonium trioxalatoferrate(III) trihydrate	= Ferric ammonium oxalate
Ammonium zinc chloride	= Zinc ammonium chloride
Amorphous phosphorus	= Phosphorus, red
AMP-95	= 2-Amino-2-methyl-1-propanol (90% or less)
AMP	= 2-Amino-2-methyl-1-propanol (90% or less)
AMS	= Ammonium sulfamate
Amyl acetate (all isomers)	= Amyl acetate (all isomers)
Amyl acetate, mixed isomers	= Amyl acetate (all isomers)
sec-Amyl acetate	= sec-Amyl acetate
tert-Amyl acetate	= tert-Amyl acetate
1-Amyl alcohol	= n-Amyl alcohol
n-Amyl alcohol	= n-Amyl alcohol
Amyl aldehyde	= n-Valeraldehyde
Amyl aldehyde	= Valeraldehyde
n-Amyl chloride	= n-Amyl chloride

SYNONYM	COMPOUND NAMES
Amyl chloride	= n-Amyl chloride
Amyl ethyl ketone	= Ethyl amyl ketone
Amyl hydrosulfide	= n-Amyl mercaptan
n-Amyl mercaptan	= n-Amyl mercaptan
n-Amyl methyl ketone	= n-Amyl methyl ketone
n-Amyl nitrate	= n-Amyl nitrate
iso-Amyl nitrite	= iso-Amyl nitrite
Amyl nitrite	= iso-Amyl nitrite
Amyl phthalate	= Amyl phthalate
n-Amyl propionate	= n-Pentyl propionate
Amyl sulfhydrate	= n-Amyl mercaptan
Amyl thioalcohol	= n-Amyl mercaptan
n-Amylcarbinol	= 1-Hexanol
Amylcarbinol	= 1-Hexanol
alpha-n-Amylene	= 1-Pentene
n-Amyltrichlorosilane	= n-Amyltrichlorosilane
Anacardic acid	= Oil, misc: cashew nut shell
Anesthesia ether	= Ethyl ether
Anesthetic ether	= Ethyl ether
Anglislite	= Lead sulfate
"Anhydride" of ammonium carbonate	= Ammonium carbamate
Anhydrone	= Magnesium perchlorate
Anhydrous aluminum chloride	= Aluminum chloride
Anhydrous chloral	= Trichloroacetaldehyde
Aniline oil	= Aniline
Aniline, 2,6-diethyl	= 2,6-Diethylaniline
Aniline, 2,6-dimethyl	= 2,6-Dimethylaniline
Aniline	= Aniline
Anilinobenzene	= Diphenylamine
Anilinomethane	= N-Methylaniline
Animal carbon	= Charcoal
o-Anisic acid	= Methyl salicylate
Anisoyl chloride	= Anisoyl chloride
p-Anisoyl chloride	= Anisoyl chloride
Anol	= Cyclohexanol
Anone	= Cyclohexanone
Ansar	= Cacodylic acid
Ansul ether 12'	= Ethylene glycol dimethyl ether
Ansul ether 121	= Ethylene glycol dimethyl ether
Anthon	= Trichlorfon
Anthracene	= Anthracene
Anthracin	= Anthracene
Antimonous bromide	= Antimony tribromide
Antimony (III) chloride	= Antimony trichloride
Antimony (V) chloride	= Antimony pentachloride
Antimony pentachloride	= Antimony pentachloride
Antimony pentafluoride	= Antimony pentafluoride
Antimony perchloride	= Antimony pentachloride
Antimony potassium tartrate	= Antimony potassium tartrate
Antimony tribromide	= Antimony tribromide
Antimony trichloride	= Antimony trichloride
Antimony trifluoride	= Antimony trifluoride
Antimony trioxide	= Antimony trioxide
Aouara oil	= Oils, edible: tucum

SYNONYM	COMPOUND NAMES
APO	= Tris(Aziridinyl)phosphine oxide
Aqua ammonia	= Ammonium hydroxide (<28% aqueous ammonia)
Aquacide	= Diquat
Aqueous ammonia	= Ammonium hydroxide (<28% aqueous ammonia)
Arcosolv	= Dipropylene glycol methyl ether
Arcton 6	= Dichlorodifluoromethane
Arcton 9	= Trichlorofluoromethane
Argentous fluoride	= Silver fluoride
Argentous oxide	= Silver oxide
Arizole	= Oil, misc: pine
Arochlor	= Polychlorinated biphenyl
Arosol	= Ethylene glycol phenyl ether
Arsecodile	= Sodium cacodylate
Arsenic acid anhydride	= Arsenic pentaoxide
Arsenic acid	= Arsenic acid
Arsenic chloride	= Arsenic trichloride
Arsenic disulfide	= Arsenic disulfide
Arsenic oxide	= Arsenic pentaoxide
Arsenic pentaoxide	= Arsenic pentaoxide
Arsenic pentoxide	= Arsenic acid
Arsenic pentoxide	= Arsenic pentaoxide
Arsenic sesquioxide	= Arsenic trioxide
Arsenic trichloride	= Arsenic trichloride
Arsenic trioxide	= Arsenic trioxide
Arsenic trisulfide	= Arsenic trisulfide
Arsenic yellow	= Arsenic trisulfide
Arsenic, metallic	= Arsenic
Arsenic, solid	= Arsenic
Arsenic	= Arsenic
Arsenious acid, potassium salt	= Potassium arsenite
Arsenious chloride	= Arsenic trichloride
Arsenous acid anhydride	= Arsenic trioxide
Arsenous acid, calcium salt	= Calcium arsenite
Arsenous acid	= Arsenic trioxide
Arsenous chloride	= Arsenic trichloride
Arsenous oxide	= Arsenic trioxide
Arsicodile	= Sodium cacodylate
Arsycodile	= Sodium cacodylate
Arthodibrom	= Naled
Artic	= Methyl chloride
Artificial cinnabar	= Mercuric sulfide
Asphalt blending stocks: roofers flux	= Asphalt blending stocks: roofers flux
Asphalt blending stocks: straight run residue	= Asphalt blending stocks: straight run residue
Asphalt cements	= Asphalt
Asphalt	= Asphalt
Asphaltic bitumen	= Asphalt
Asphaltum oil	= Asphalt blending stocks: roofers flux
Asphaltum	= Asphalt blending stocks: roofers flux
ATE	= Triethylaluminum
Atrazine	= Atrazine
Australene	= Pinene

SYNONYM	COMPOUND NAMES
Avitrol	= 4-Aminopyridine
Avlothane	= Hexachloroethane
Avolin	= Dimethyl phthalate
10-Azaanthracene	= Acridine
Azacycloheptane	= Hexamethylenimine
1-Azanaphthalene	= Quinoline
Azinphos methyl	= Azinphos methyl
Azirane	= Ethyleneimine
Aziridine	= Ethyleneimine
Tris(1-AziridinyI) phosphine oxide	= Tris(AziridinyI)phosphine oxide
Tris(AziridinyI)phosphine oxide	= Tris(AziridinyI)phosphine oxide
Azoic diazo component 37	= 4-Nitroaniline
Azoic diazo component 6	= 2-Nitroaniline
Banana oil	= Isoamylacetate
Banana oil	= sec-Amyl acetate
Banvel D	= Dicamba
Barium binoxide	= Barium peroxide
Barium carbonate	= Barium carbonate
Barium chlorate monohydrate	= Barium chlorate
Barium chlorate	= Barium chlorate
Barium cyanide solid	= Barium cyanide
Barium cyanide	= Barium cyanide
Barium dioxide	= Barium peroxide
Barium nitrate	= Barium nitrate
Barium perchlorate trihydrate	= Barium perchlorate
Barium perchlorate	= Barium perchlorate
Barium permanganate	= Barium permanganate
Barium peroxide	= Barium peroxide
Barium superoxide	= Barium peroxide
Basic bismuth choride	= Bismuth oxychloride
Basic copper acetate	= Copper subacetate
Basic zirconium chloride	= Zirconium oxychloride
Battery acid	= Sulfuric acid
Bay 37344	= Mercaptodimethur
Bayer 13/59	= Trichlorfon
Bearing oil	= Oils, miscellaneous: spindle
Beet sugar	= Sucrose
Benzal chloride	= Benzal chloride
Benzaldehyde	= Benzaldehyde
1-Benzazine	= Quinoline
Benzenamine	= Aniline
Benzene-1,3-dicarboxylic acid	= Isophthalic acid
Benzene chloride	= Chlorobenzene
1,2-Benzene dicarboxylic acid, di-(2-methylpropyl)ester	= Diisobutyl phthalate
Benzene fluoride	= Fluorobenzene
gamma-Benzene hexachloride	= gamma-Benzene hexachloride
Benzene phosphorus dichloride	= Benzene phosphorus dichloride
Benzene phosphorus thiodichloride	= Benzene phosphorus thiodichloride
Benzene sulfochloride	= Benzenesulfonyl chloride
Benzene sulfonechloride	= Benzenesulfonyl chloride
Benzene, 1-chloro-2-methyl	= o-Chlorotoluene
Benzene, 1,2,3-trichloro-	= 1,2,3-Trichlorobenzene
Benzene, 1,2,4-trichloro-	= 1,2,4-Trichlorobenzene

SYNONYM	COMPOUND NAMES
Benzene, diisopropyl	= Diisopropylbenzene (all isomers)
Benzene, hexachloro-	= Hexachlorobenzene
Benzene, propyl	= n-Propylbenzene
Benzene	= Benzene
Benzeneamine, 2,6-diethyl- (9ci)	= 2,6-Diethylaniline
Benzenecarbinol	= Benzyl alcohol
Benzenecarbonyl chloride	= Benzoyl chloride
Benzenecarboxylic acid	= Benzoic acid
1,2-Benzenedicarboxylic acid anhydride	= Phthalic anhydride
1,2-Benzenedicarboxylic acid, di-isononyl ester	= Diisononyl phthalate
1,2-Benzenedicarboxylic acid, di-undecyl ester	= Diundecyl phthalate
1,2-Benzenedicarboxylic acid, diethyl ester	= Diethyl phthalate
1,2-Benzenedicarboxylic acid, dipentyl ester	= Amyl phthalate
1,2-Benzenediol	= Catechol
1,4-Benzenediol	= Hydroquinone
1,3-Benzenediol	= Resorcinol
Benzenesulfochloride	= Benzenesulfonyl chloride
Benzenesulfonic (acid) chloride	= Benzenesulfonyl chloride
Benzenesulfonyl chloride	= Benzenesulfonyl chloride
Benzenethiol	= Benzenethiol
Benzenethiophosphonyl chloride	= Benzene phosphorus thiodichloride
1,2,3-Benzenetriol	= Pyrogalllic acid
Benzidine	= Benzidine
Benzinoform	= Carbon tetrachloride
Benzo (b) pyridine	= Quinoline
Benzo (b) quinoline	= Acridine
Benzoflex 9-88 SG	= Dipropylene glycol dibenzoate
Benzoflex 9-88	= Dipropylene glycol dibenzoate
Benzoflex 9-98	= Dipropylene glycol dibenzoate
Benzoic acid nitrile	= Benzonitrile
Benzoic acid, 2-methoxy-	= Methyl salicylate
Benzoic acid, ammonium salt	= Ammonium benzoate
Benzoic acid, methyl ester	= Methyl benzoate
Benzoic acid	= Benzoic acid
Benzoic aldehyde	= Benzaldehyde
Benzol	= Benzene
Benzole	= Benzene
Benzonitrile	= Benzonitrile
Benzophenone	= Benzophenone
p-Benzoquinone	= p-Benzoquinone
Benzoquinone	= p-Benzoquinone
1,4-Benzoquinone	= p-Benzoquinone
2-Benzothiazolethiol, sodium salt	= Sodium 2-mercaptobenzothiazol solution
2-(3h)-Benzothiazolethione, sodium salt	= Sodium 2-mercaptobenzothiazol solution
Benzoyl benzene	= Benzophenone
Benzoyl chloride	= Benzoyl chloride
Benzoyl peroxide	= Dibenzoyl peroxide
Benzoyl superoxide	= Dibenzoyl peroxide
Benzyl acetate	= Benzyl acetate
Benzyl alcohol	= Benzyl alcohol

SYNONYM	COMPOUND NAMES
Benzyl bromide	= Benzyl bromide
Benzyl chloride	= Benzyl chloride
Benzyl chlorocarbonate	= Benzyl chloroformate
Benzyl chloroformate	= Benzyl chloroformate
Benzyl dichloride	= Benzal chloride
Benzyl dimethylamine	= Benzyl dimethylamine
Benzyl ethanoate	= Benzyl acetate
Benzyl ether	= Dibenzyl ether
Benzyl n-butyl phthalate	= Butyl benzyl phthalate
Benzylamine	= Benzylamine
Benzylcarbonyl chloride	= Benzyl chloroformate
Benzyl dimethyloctadecyl ammonium chloride	= Benzyl dimethyloctadecyl ammonium chloride
Benzyl dimethylstearyl ammonium chloride	= Benzyl dimethyloctadecyl ammonium chloride
Benzylene chloride	= Benzal chloride
Benzylidene chloride	= Benzal chloride
Benzyltrimethylammonium chloride	= Benzyltrimethylammonium chloride
Beryllia	= Beryllium oxide
Beryllium chloride	= Beryllium chloride
Beryllium fluoride	= Beryllium fluoride
Beryllium nitrate trihydrate	= Beryllium nitrate
Beryllium nitrate	= Beryllium nitrate
Beryllium oxide	= Beryllium oxide
Beryllium sulfate tetrahydrate	= Beryllium sulfate
Beryllium sulfate	= Beryllium sulfate
Beryllium	= Beryllium
beta-trichloroethane	= 1,1,2-Trichloroethane
Betraprone	= beta-Propiolactone
Betula or gaultheria oil	= Methyl salicylate
BHC	= gamma-Benzene hexachloride
p,p'-Bianiline	= Benidine
Bibenzene	= Diphenyl
Bichrome	= Potassium dichromate
Bieberite	= Cobalt sulfate
Biethylene	= Butadiene
Biformyl	= Glyoxal
Bioflex 91	= Dinonyl phthalate
(1,1'-Biphenyl)-4,4'-diamine	= Benidine
Biphenyl	= Diphenyl
1,1'-Biphenyl	= Diphenyl
Bis(2-ethylhexyl) adipate	= Di-(2-ethylhexyl) adipate
Bis(glycinato) copper	= Copper glycinate
Bis(methylcyclopentadiene)	= Methylcyclopentadiene dimer
Bismuth chloride oxide	= Bismuth oxychloride
Bismuth oxychloride	= Bismuth oxychloride
Bismuth subchloride	= Bismuth oxychloride
Bismuthyl chloride	= Bismuth oxychloride
Bisphenol A - epichlorohydrin condensate	= Bisphenol A diglycidyl ether
Bisphenol A diglycidyl ether	= Bisphenol A diglycidyl ether
Bisphenol A	= Bisphenol A
Bitumen	= Asphalt
Bivinyll	= Butadiene

SYNONYM	COMPOUND NAMES
Black leaf 40 (40% water solution)	= Nicotine sulfate
Bladan	= Tetraethyl pyrophosphate
Bleach	= Sodium hypochlorite solution
Blue oil	= Aniline
Blue verdigris	= Copper subacetate
Blue vitriol	= Copper sulfate
Boiler compound, liquid	= Boiler compound, liquid
Boletic acid	= Fumaric acid
Boracic acid	= Boric acid
Borax, anhydrous	= Sodium borate
Boric acid	= Boric acid
Borohydride	= Sodium borohydride
Borohydride	= Sodium hydroxide solution
Boron chloride	= Boron trichloride
Boron tribromide	= Boron tribromide
Boron trichloride	= Boron trichloride
Bottled gas	= Liquefied petroleum gas
Box toe gum	= Collodion
BP	= Dibenzoyl peroxide
BPO	= Dibenzoyl peroxide
Brimstone	= Sulfur
Brocide	= Ethylene dichloride
Bromallylene	= Allyl bromide
Bromelite	= Beryllium oxide
Bromex	= Naled
Bromine pentafluoride	= Bromine pentafluoride
Bromine trifluoride	= Bromine trifluoride
Bromine	= Bromine
1-Bromo-2-propanone	= Bromoacetone
Bromo-2-propanone	= Bromoacetone
Bromoacetone	= Bromoacetone
Bromoacetyl bromide	= Bromoacetyl bromide
Bromobenzene	= Bromobenzene
Bromobenzol	= Bromobenzene
1-Bromobutane	= 1-Bromobutane
n-Bromobutane	= 1-Bromobutane
2-Bromobutane	= 2-Bromobutane
Bromoethanoyl bromide	= Bromoacetyl bromide
Bromoform	= Bromoform
Bromofume	= Ethylene dibromide
Bromomethane	= Methyl bromide
Bromomethyl methyl ketone	= Bromoacetone
2-Bromopentane	= 2-Bromopentane
1-Bromopropane	= 1-Bromopropane
3-Bromopropene	= Allyl bromide
3-Bromopropylene	= Allyl bromide
Bromotoluene, alpha	= Benzyl bromide
omega-Bromotoluene	= Benzyl bromide
alpha-Bromotoluene	= Benzyl bromide
(-)Brucine dihydrate	= Brucine
Brucine	= Brucine
BTMAC	= Benzyltrimethylammonium chloride
Bunker C oil	= Oils, fuel: no. 6
1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	= Hexachlorobutadiene

SYNONYM	COMPOUND NAMES
Butadiene	= Butadiene
1,3-Butadiene	= Butadiene
Butaldehyde	= n-Butyraldehyde
Butanal	= n-Butyraldehyde
1-Butanamine, n-butyl	= Di-n-butylamine
Butane	= Butane
n-Butane	= Butane
1,4-Butanedicarboxylic acid	= Adipic acid
1,4-Butanediol	= 1,4-Butanediol
Butanediol	= Butylene glycol
Butanenitrile	= Butyronitrile
1-Butanethiol	= n-Butyl mercaptan
Butanic acid	= n-Butyric acid
Butanoic acid, 3-oxo-methyl ester (9ci)	= Methyl acetoacetate
Butanoic acid, butyl ester	= Butyl butyrate
Butanoic acid, methyl ester	= Methyl butyrate
Butanoic acid	= n-Butyric acid
1-Butanol, 3-methoxyacetate	= 3-Methoxybutyl acetate
Butanol	= n-Butyl alcohol
1-Butanol	= n-Butyl alcohol
2-Butanol	= sec-Butyl alcohol
2-Butanone peroxide	= 2-Butanone peroxide
2-Butanone, peroxide	= 2-Butanone peroxide
2-Butanone	= Methyl ethyl ketone
Butanox M50, M105, LPT	= 2-Butanone peroxide
Butanoyl chloride	= Butyryl chloride
3-Buten-2-one	= Methyl vinyl ketone
1-Buten-3-ol, 3-methyl	= Methyl butenol
trans-2-Butenal	= Crotonaldehyde
cis-2-Butene-1, 4-diol	= 1,4-Butenediol
2-Butene-1, 4-diol	= 1,4-Butenediol
1-Butene oxide	= 1,2-Butylene oxide
Butene resins	= Polybutene
1-Butene	= Butylene
trans-Butenedioic acid	= Fumaric acid
cis-Butenedioic acid	= Maleic acid
cis-Butenedioic anhydride	= Maleic anhydride
1,4-Butenediol	= 1,4-Butenediol
1-Butoxy-2,3-epoxypropane	= n-Butyl glycidyl ether
1-Butoxy butane	= Di-n-butyl ether
Butoxydiethylene glycol	= Diethylene glycol monobutyl ether
Butoxydiglycol	= Diethylene glycol monobutyl ether
2-Butoxyethanol acetate	= Ethylene glycol monobutyl ether acetate
2-Butoxyethanol	= Ethylene glycol monobutyl ether
2-(2-Butoxyethoxy) ethanol acetate	= Diethylene glycol monobutyl ether acetate
2-(2-Butoxyethoxy) ethanol	= Diethylene glycol monobutyl ether
2-Butoxyethyl acetate	= Ethylene glycol monobutyl ether acetate
Bis(2-Butoxyethyl) ether	= Diethylene glycol dibutyl ether
Butoxyl	= 3-Methoxybutyl acetate
Butoxypropyl trichlorophenoxyacetate	= 2,4,5-T esters
Butyric acid, 2-hydroxy-4-methylthio-	= 2-Hydroxy-4-(methylthio)-butanoic acid
Butter of antimony	= Antimony trichloride
Butter of arsenic	= Arsenic trichloride



SYNONYM	COMPOUND NAMES
Buttercup yellow	= Zinc chromate
Butyl "carbitol" acetate	= Diethylene glycol monobutyl ether acetate
Butyl "carbitol"	= Diethylene glycol monobutyl ether
Butyl "cellosolve" acetate	= Ethylene glycol monobutyl ether acetate
Butyl 2-methacrylate	= n-Butyl methacrylate
Butyl 2-methyl-2-propenoate	= n-Butyl methacrylate
n-Butyl 2-propenoate	= n-Butyl acrylate
Butyl 2,4-dichlorophenoxyacetate	= 2,4-D esters
Butyl 2,4,5- trichlorophenoxyacetate	= 2,4,5-T esters
Butyl a-hydroxypropionate	= Butyl lactate
n-Butyl acetate	= n-Butyl acetate
Butyl acetate	= n-Butyl acetate
sec-Butyl acetate	= sec-Butyl acetate
tert-Butyl acetate	= tert-Butyl acetate
iso-Butyl acrylate	= iso-butyl acrylate
n-Butyl acrylate	= n-Butyl acrylate
Butyl acrylate	= n-Butyl acrylate
Butyl alcohol	= n-Butyl alcohol
n-Butyl alcohol	= n-Butyl alcohol
sec-Butyl alcohol	= sec-Butyl alcohol
tert-Butyl alcohol	= tert-Butyl alcohol
Butyl aldehyde	= n-Butyraldehyde
n-Butyl alpha-methylacrylate	= n-Butyl methacrylate
Butyl benzyl phthalate	= Butyl benzyl phthalate
n-Butyl bromide	= 1-Bromobutane
Butyl bromide	= 1-Bromobutane
sec-Butyl bromide	= 2-Bromobutane
Butyl butanoate	= Butyl butyrate
Butyl butyrate	= Butyl butyrate
Butyl cellosolve	= Ethylene glycol monobutyl ether
n-Butyl chloride	= Butyl chloride
Butyl chloride	= Butyl chloride
n-Butyl chlorocarbonate	= n-Butyl chloroformate
n-Butyl chloroformate	= n-Butyl chloroformate
Butyl diglyme	= Diethylene glycol dibutyl ether
Butyl ethanoate	= n-Butyl acetate
Butyl ether	= Di-n-butyl ether
n-Butyl ether	= Di-n-butyl ether
Butyl ethyl ketone	= Ethyl butyl ketone
n-Butyl formal	= n-Valeraldehyde
n-Butyl formate	= n-Butyl formate
n-Butyl glycidyl ether	= n-Butyl glycidyl ether
tert-Butyl hydroperoxide	= tert-Butyl hydroperoxide
Butyl lactate	= Butyl lactate
n-Butyl mercaptan	= n-Butyl mercaptan
n-Butyl methacrylate	= n-Butyl methacrylate
Butyl methacrylate	= n-Butyl methacrylate
tert-Butyl methyl ether	= Methyl tert-butyl ether
n-Butyl methyl ketone	= Methyl n-butyl ketone
Butyl phthalate	= Dibutyl phthalate
n-Butyl propionate	= n-Butyl propionate
Butyl titanate monomer	= Tetrabutyl titanate
Butyl titanate	= Tetrabutyl titanate

SYNONYM	COMPOUND NAMES
Butyl toluene	= Butyl toluene
Butyl, decyl, cetyl-eicosyl methacrylate	= Butyl, decyl, cetyl-eicosyl methacrylate
Butyl, decyl, cetyl, eicosyl 2-methyl-2-propenoate	= Butyl, decyl, cetyl-eicosyl methacrylate
Butylacetic acid	= Hexanoic acid
Butylaldehyde	= n-Butyraldehyde
iso-Butylamine	= Isobutylamine
n-Butylamine	= n-Butylamine
Butylamine	= n-Butylamine
Mono-n-Butylamine	= n-Butylamine
sec-Butylamine	= sec-Butylamine
tert-Butylamine	= tert-Butylamine
n-Butylcarbinol	= n-Amyl alcohol
n-Butylcarbonyl chloride	= n-Amyl chloride
2-Butylene dichloride	= Dichlorobutene
1,4-Butylene glycol	= 1,4-Butanediol
Butylene glycol	= Butylene glycol
Butylene hydrate	= sec-Butyl alcohol
Butylene oxide	= 1,2-Butylene oxide
Alpha-Butylene oxide	= 1,2-Butylene oxide
1,2-Butylene oxide	= 1,2-Butylene oxide
Butylene	= Butylene
Butylethylacetaldehyde	= Ethylhexaldehyde
Butylethylacetaldehyde	= Ethylhexaldehyde
Butylethylacetic acid	= 2-Ethylhexanoic acid
Butylethylamine	= N-Ethyl-n-butylamine
p-tert-Butylphenol	= p-tert-butylphenol
p-tert-Butyltoluene	= Butyl toluene
4-tert-Butyltoluene	= Butyl toluene
n-Butyltrichlorosilane	= Butyltrichlorosilane
Butyltrichlorosilane	= Butyltrichlorosilane
2-Butyne-1, 4-diol	= 1,4-Butynediol
1,4-Butynediol	= 1,4-Butynediol
iso-Butyraldehyde	= iso-butyraldehyde
n-Butyraldehyde	= n-Butyraldehyde
Butyraldehyde	= n-Butyraldehyde
Butyric acid nitrile	= Butyronitrile
Butyric acid, butyl ester	= Butyl butyrate
Butyric acid, ethyl ester	= Ethyl butyrate
Butyric acid, methyl ester	= Methyl butyrate
n-Butyric acid	= n-Butyric acid
Butyric acid	= n-Butyric acid
Butyric aldehyde	= n-Butyraldehyde
Butyric ether	= Ethyl butyrate
Butyrol chloride	= Butyryl chloride
Butyronitrile	= Butyronitrile
n-Butyryl chloride	= Butyryl chloride
Butyryl chloride	= Butyryl chloride
C-1297	= Lauric acid
C-8 acid	= Octanoic acid
Cacodylic acid	= Cacodylic acid
Cadmium acetate dihydrate	= Cadmium acetate
Cadmium acetate	= Cadmium acetate
Cadmium bromide tetrahydrate	= Cadmium bromide

SYNONYM	COMPOUND NAMES
Cadmium bromide	= Cadmium bromide
Cadmium chloride	= Cadmium chloride
Cadmium fluoborate solution	= Cadmium fluoroborate
Cadmium fluoborate	= Cadmium fluoroborate
Cadmium fluoroborate	= Cadmium fluoroborate
Cadmium fume	= Cadmium oxide
Cadmium nitrate tetrahydrate	= Cadmium nitrate
Cadmium nitrate	= Cadmium nitrate
Cadmium oxide	= Cadmium oxide
Cadmium sulfate	= Cadmium sulfate
Cadox HDP	= Cyclohexanone peroxide
Cadox PS	= Di-(p-chlorobenzoyl) peroxide
Cadox TBH	= tert-Butyl hydroperoxide
Cake aluminum	= Aluminum sulfate
Calamine	= Zinc carbonate
Calcium abietate	= Calcium resinate
Calcium abietate	= Calcium resinate
Calcium alkylaromatic sulfonate	= Dodecylbenzenesulfonic acid, calcium salt
Calcium alkylbenzenesulfonate	= Dodecylbenzenesulfonic acid, calcium salt
Calcium arsenate	= Calcium arsenate
Calcium arsenite solid	= Calcium arsenite
Calcium arsenite	= Calcium arsenite
Calcium biphosphate	= Calcium phosphate
Calcium carbide	= Calcium carbide
Calcium chlorate	= Calcium chlorate
Calcium chloride hydrates	= Calcium chloride
Calcium chloride, anhydrous	= Calcium chloride
Calcium chloride	= Calcium chloride
Calcium chromate (vi)	= Calcium chromate
Calcium chromate dihydrate	= Calcium chromate
Calcium chromate	= Calcium chromate
Calcium cyanide	= Calcium cyanide
Calcium dioxide	= Calcium peroxide
Calcium fluoride	= Calcium fluoride
Calcium hydroxide	= Calcium hydroxide
Calcium hypochlorite	= Calcium hypochlorite
Calcium nitrate tetrahydrate	= Calcium nitrate
Calcium nitrate	= Calcium nitrate
Calcium oxide	= Calcium oxide
Calcium peroxide	= Calcium peroxide
Calcium phosphate	= Calcium phosphate
Calcium phosphide	= Calcium phosphide
Calcium pyrophosphate	= Calcium phosphate
Calcium resinate, fused	= Calcium resinate
Calcium resinate	= Calcium resinate
Calcium rosin	= Calcium resinate
Calcium superphosphate	= Calcium phosphate
Calcium	= Calcium
Calochlor	= Mercuric chloride
Calomel	= Mercurous chloride
Camphene	= Camphene
Camphor oil	= Camphor oil

SYNONYM	COMPOUND NAMES
Cane sugar	= Sucrose
Capraldehyde	= Decaldehyde
n-Capric acid	= Decanoic acid
Capric alcohol	= n-Decyl alcohol
Capric aldehyde	= Decaldehyde
Caprinic acid	= Decanoic acid
Caproaldehyde	= n-Hexaldehyde
n-Caproic acid	= Hexanoic acid
epsilon-Caprolactam	= Caprolactam
Caprolactam	= Caprolactam
Capronaldehyde	= n-Hexaldehyde
Capronic acid	= Hexanoic acid
Capronic aldehyde	= n-Hexaldehyde
n-Caproylaldehyde	= n-Hexaldehyde
Caprylene	= 1-Octene
n-Caprylic acid	= Octanoic acid
Captan	= Captan
Carbamaldehyde	= Formamide
Carbamic acid, ammonium salt	= Ammonium carbamate
Carbamide peroxide	= Urea peroxide
Carbamide	= Urea
Carbaryl	= Carbaryl
Carbide	= Calcium carbide
Carbitol	= Diethylene glycol monoethyl ether
Carbobenzoxyl chloride	= Benzyl chloroformate
Carbofuran	= Carbofuran
Carbolic acid	= Carbolic oil (mixture)
Carbolic acid	= Phenol
Carbolic oil (mixture)	= Carbolic oil (mixture)
Carbon bisulfide	= Carbon disulfide
Carbon dioxide	= Carbon dioxide
Carbon disulfide	= Carbon disulfide
Carbon monoxide	= Carbon monoxide
Carbon oxyfluoride	= Carbon oxyfluoride
Carbon tet	= Carbon tetrachloride
Carbon tetrachloride	= Carbon tetrachloride
Carbonic acid gas	= Carbon dioxide
Carbonic acid, diethyl ester	= Diethyl carbonate
Carbonic acid, monoammonium salt	= Ammonium bicarbonate
Carbonic acid, thallium (1+) salt	= Thallium carbonate
Carbonic anhydride	= Carbon dioxide
Carbonic difluoride	= Carbon oxyfluoride
Carbonochloridic acid, butyl ester	= n-Butyl chloroformate
Carbonyl chloride	= Phosgene
Carbonyl diamine peroxide	= Urea peroxide
Carbonyl difluoride	= Carbon oxyfluoride
Carbonyl fluoride	= Carbon oxyfluoride
Carbonyldiamide	= Urea
Carboxylbenzene	= Benzoic acid
Carene	= Carene
3-Carene	= Carene
Carolid AL	= Diphenyl
Carpeting medium	= Asphalt blending stocks: straight run residue

SYNONYM	COMPOUND NAMES
Carthamus tinctorius oil	= Oils, edible: safflower
Carwinate 125 M	= Diphenylmethane diisocyanate
Cashew nutshell liquid	= Oil, misc: cashew nut shell
Cashew nutshell oil	= Oil, misc: cashew nut shell
Casoron	= Dichlobenil
Catalyst 9915	= Benzyl dimethylamine
Catechin	= Catechol
Catechol	= Catechol
Caustic arsenic chloride	= Arsenic trichloride
Caustic potash solution	= Caustic potash solution
Caustic potash	= Potassium hydroxide
Caustic soda solution	= Caustic soda solution
Caustic soda	= Sodium hydroxide
Cellosolve acetate	= 2-Ethoxyethyl acetate
Cellosolve acetate	= Ethylene glycol monoethyl ether acetate
Cellosolve	= 2-Ethoxyethanol
Cellosolve	= Ethylene glycol monoethyl ether
Cellulose nitrate solution	= Collodion
Cetyl sodium sulfate	= Hexadecyl sulfate, sodium salt
Cetyltrimethylammonium chloride solution	= Hexadecyltrimethylammonium chloride
CGA24705	= Metolachlor
Chaloxyd MEKP-ha 1, -la 1	= 2-Butanone peroxide
Chamber acid	= Sulfuric acid
Charcoal	= Charcoal
Chem bam	= Nabam
Chile saltpeter	= Sodium nitrate
Chinese red	= Mercuric sulfide
Chinese tannin	= Tannic acid
Chinese tannin	= Tannic acid
Chinoline	= Quinoline
Chloracetic acid	= Chloroacetic acid
Chloracetic acid	= Chloroacetic acid (80% or less)
Chloracetyl chloride	= Chloroacetyl chloride
Chloral	= Trichloroacetaldehyde
Chlorate of potash	= Potassium chlorate
Chlorate of potassium	= Potassium chlorate
Chlorate of soda	= Sodium chlorate
Chlorate of soda	= Sodium chlorate solution
Chlorbenzal	= Benzal chloride
Chlordan	= Chlordane
Chlordane	= Chlordane
Chlordecone	= Kepone
2-Chlorethanol	= Ethylene chlorohydrin
Chlorethylene	= Vinyl chloride
Chlorex	= 2,2-Dichloroethyl ether
Chloride of amyl	= n-Amyl chloride
Chlorinated biphenyl	= Polychlorinated biphenyl
Chlorinated hydrochloric ether	= 1,1-Dichloroethane
Chlorine trifluoride	= Chlorine trifluoride
Chlorine	= Chlorine
2-Chloro-1-ethanal	= Chloroacetaldehyde
2-Chloro-1-hydroxybenzene	= o-Chlorophenol
3-Chloro-1-methylbenzene	= m-Chlorotoluene

SYNONYM	COMPOUND NAMES
2-Chloro-1-methylbenzene	= o-Chlorotoluene
4-Chloro-1-methylbenzene	= p-Chlorotoluene
1-Chloro-1-nitropropane	= 1-Chloro-1-nitropropane
3-Chloro-1, 2-propylene oxide	= Epichlorohydrin
2-Chloro-1, 3-butadiene	= Chloroprene
1-Chloro-1, 1,2,2-tetrafluoroethane	= Monochlorotetrafluoroethane
5-Chloro-2-aminotoluene	= 4-Chloro-o-toluidine
4-Chloro-2-methylaniline	= 4-Chloro-o-toluidine
3-Chloro-2-methylpropene	= Methallyl chloride
1-Chloro-2-nitrobenzene	= o-Chloronitrobenzene
1-Chloro-2,3-epoxypropane	= Epichlorohydrin
1-Chloro-3-methylbenzene	= m-Chlorotoluene
2-Chloro-4-ethylamino-6-	= Atrazine
1-Chloro-4-methylbenzene	= p-Chlorotoluene
4-Chloro-o-toluidine	= 4-Chloro-o-toluidine
Chloroacetaldehyde, monomer	= Chloroacetaldehyde
Chloroacetaldehyde	= Chloroacetaldehyde
Chloroacetic acid (80% or less)	= Chloroacetic acid (80% or less)
Chloroacetic acid, ethyl ester	= Ethyl chloroacetate
Chloroacetic acid, methyl ester	= Methyl chloroacetate
Chloroacetic acid	= Chloroacetic acid
Chloroacetophenone	= Chloroacetophenone
omega-Chloroacetophenone	= Chloroacetophenone
alpha-Chloroacetophenone	= Chloroacetophenone
Chloroacetyl chloride	= Chloroacetyl chloride
2-Chloroallyl chloride	= 2,3-Dichloropropene
p-Chloroaniline	= p-chloroaniline
4-Chloroaniline	= p-chloroaniline
Chlorobenzene	= Chlorobenzene
Bis-(p-Chlorobenzoyl) peroxide	= Di-(p-chlorobenzoyl) peroxide
p-Chlorobenzoyl peroxide	= Di-(p-chlorobenzoyl) peroxide
p,p'-Chlorobenzoyl peroxide	= Di-(p-chlorobenzoyl) peroxide
2-Chlorobuta-1, 3-diene	= Chloroprene
2-Chlorobutadiene	= Chloroprene
1-Chlorobutane	= Butyl chloride
4-Chlorobutyronitrile	= 4-Chlorobutyronitrile
Chlorocarbonic acid, methyl ester	= Methyl chloroformate
Chlorocarbonic acid, n-butyl ester	= n-Butyl chloroformate
Chlorodifluoromethane	= Chlorodifluoromethane
Chloroethanal	= Chloroacetaldehyde
Chloroethane	= Ethyl chloride
Chloroethanoic acid	= Chloroacetic acid (80% or less)
2-Chloroethanol	= Ethylene chlorohydrin
2-Chloroethyl alcohol	= Ethylene chlorohydrin
Bis (2-Chloroethyl) ether	= 2,2-Dichloroethyl ether
Chloroform	= Chloroform
Chloroformic acid dimethylamide	= N,N-Dimethylcarbamoyl chloride
Chloroformic acid, benzyl ester	= Benzyl chloroformate
Chloroformic acid, benzyl ester	= Benzyl chloroformate
Chloroformic acid, ethyl ester	= Ethyl chloroformate
Chloroformic acid, methyl ester	= Methyl chloroformate
Chloroformic acid, n-butyl ester	= n-Butyl chloroformate
Chloroformyl chloride	= Phosgene
Chlorohydrins	= Chlorohydrins

SYNONYM	COMPOUND NAMES
gamma-Chloroisobutylene	= Methallyl chloride
Bis (2-Chloroisopropyl) ether	= 2,2'-Dichloroisopropyl ether
Chloromethane	= Methyl chloride
Chloromethyl methyl ether	= Chloromethyl methyl ether
Chloromethyl phenyl ketone	= Chloroacetophenone
Chloromethyloxirane	= Epichlorohydrin
o-Chloronitrobenzene	= o-Chloronitrobenzene
o-Chlorophenol	= o-Chlorophenol
4-Chlorophenol	= p-Chlorophenol
p-Chlorophenol	= p-Chlorophenol
1,1-Bis(p-Chlorophenyl)-2,2,2-trichloroethanol	= 4,4'-dichloro-alpha-trichloromethyl benzhydrol
4-Chlorophenylamine	= p-chloroaniline
Chlorophos	= Trichlorfon
Chloropicrin	= Chloropicrin
Chloroprene	= Chloroprene
beta-Chloroprene	= Chloroprene
1-Chloropropane	= n-Propyl chloride
3-Chloropropanoic acid	= 3-Chloropropionic acid
3-Chloropropene	= Allyl chloride
2-Chloropropionic acid	= 2-Chloropropionic acid
alpha-Chloropropionic acid	= 2-Chloropropionic acid
beta-Chloropropionic acid	= 3-Chloropropionic acid
3-Chloropropionic acid	= 3-Chloropropionic acid
gamma-Chloropropylene oxide	= Epichlorohydrin
3-Chloropropylene	= Allyl chloride
Chlorosulfonic acid	= Chlorosulfonic acid
Chlorosulfuric acid	= Chlorosulfonic acid
Chlorotetrafluoroethane	= Monochlorotetrafluoroethane
Chlorothene	= Trichloroethane
omega-Chlorotoluene	= Benzyl chloride
alpha-Chlorotoluene	= Benzyl chloride
3-Chlorotoluene	= m-Chlorotoluene
m-Chlorotoluene	= m-Chlorotoluene
2-Chlorotoluene	= o-Chlorotoluene
o-Chlorotoluene	= o-Chlorotoluene
p-Chlorotoluene	= p-Chlorotoluene
4-Chlorotoluene	= p-Chlorotoluene
Chlorotrifluoroethylene	= Trifluorochloroethylene
Chlorotrifluoromethane	= Monochlorotrifluoromethane
Chlorotrimethylsilane	= Trimethylchlorosilane
1-Chloropentane	= n-Amyl chloride
Chlorpyrifos	= Dursban
Chlorosulfonic acid	= Chlorosulfonic acid
Chlorthepin	= Endosulfan
Chlorylen	= Trichloroethylene
CHP	= Cumene hydroperoxide
Chromic (III) acetate	= Chromic acetate
Chromic acetate	= Chromic acetate
Chromic acid, dilithium salt	= Lithium chromate
Chromic acid, strontium salt (1:1)	= Strontium chromate
Chromic acid	= Chromic anhydride
Chromic anhydride	= Chromic anhydride
Chromic oxide	= Chromic anhydride

SYNONYM	COMPOUND NAMES
Chromic sulfate	= Chromic sulfate
Chromium (VI) dioxychloride	= Chromyl chloride
Chromium acetate	= Chromic acetate
Chromium chloride	= Chromous chloride
Chromium dichloride	= Chromous chloride
Chromium III sulfate	= Chromic sulfate
Chromium lithium oxide	= Lithium chromate
Chromium oxychloride	= Chromyl chloride
Chromium sulfate	= Chromic sulfate
Chromium triacetate	= Chromic acetate
Chromium trioxide	= Chromic anhydride
Chromous chloride	= Chromous chloride
Chromyl chloride	= Chromyl chloride
Cianurina	= Mercuric cyanide
Citric acid, diammonium salt	= Ammonium citrate, dibasic
Citric acid	= Citric acid
Clorox	= Sodium hypochlorite
Clorox	= Sodium hypochlorite solution
Co-ral	= Coumaphos
Coal tar pitch	= Coal tar pitch
Coalite NTP	= Trixylenyl phosphate
Cobalt (II) bromide	= Cobalt bromide (ous)
Cobalt (II) chloride	= Cobalt chloride
Cobalt (II) fluoride	= Cobalt fluoride
Cobalt acetate tetrahydrate	= Cobalt acetate
Cobalt acetate	= Cobalt acetate
Cobalt amino sulfonate	= Cobalt sulfamate
Cobalt bromide (ous)	= Cobalt bromide (ous)
Cobalt chloride	= Cobalt chloride
Cobalt dibromide	= Cobalt bromide (ous)
Cobalt difluoride	= Cobalt fluoride
Cobalt diformate	= Cobalt formate
Cobalt fluoride	= Cobalt fluoride
Cobalt formate	= Cobalt formate
Cobalt nitrate	= Cobalt nitrate
Cobalt sulfamate	= Cobalt sulfamate
Cobalt sulfate	= Cobalt sulfate
Cobalt(II) acetate	= Cobalt acetate
Cobalt(II) nitrate	= Cobalt nitrate
Cobalt(II) sulfate	= Cobalt sulfate
Cobaltous acetate	= Cobalt acetate
Cobaltous bromide	= Cobalt bromide (ous)
Cobaltous chloride dihydrate	= Cobalt chloride
Cobaltous chloride hexahydrate	= Cobalt chloride
Cobaltous chloride	= Cobalt chloride
Cobaltous formate	= Cobalt formate
Cobaltous nitrate hexahydrate	= Cobalt nitrate
Cobaltous nitrate	= Cobalt nitrate
Cobaltous sulfamate	= Cobalt sulfamate
Cobaltous sulfate heptahydrate	= Cobalt sulfate
Coconut butter	= Oils, edible: coconut
Coconut oil	= Oils, edible: coconut
Cocure 26	= Phenylmercuric acetate
Codal	= Metolachlor



SYNONYM	COMPOUND NAMES
Codoil	= Oils, miscellaneous: resin
Codoil	= Oils, miscellaneous: rosin
Collodion	= Collodion
Cologne spirit	= Ethyl alcohol
Colonial spirit	= Methyl alcohol
Columbian spirit	= Methyl alcohol
Combustion improver C-12	= Methylcyclopentadienylmanganese tricarbonyl
Common verdigris	= Copper subacetate
Compound 1080	= Sodium fluoroacetate
Condensed phosphoric acid	= Polyphosphoric acid
Conoco SA 597	= Dodecylbenzenesulfonic acid
Copper acetate	= Copper acetate
Copper acetoarsenite	= Copper acetoarsenite
Copper ammonium sulfate	= Copper sulfate, ammoniated
Copper arsenite	= Copper arsenite
Copper borofluoride solution	= Copper fluoroborate
Copper bromide (ous)	= Copper bromide (ous)
Copper bromide	= Copper bromide
Copper chloride	= Copper chloride
Copper cyanide (ous)	= Copper cyanide (ous)
Copper fluoroborate	= Copper fluoroborate
Copper formate	= Copper formate
Copper glycinate	= Copper glycinate
Copper iodide	= Copper iodide
Copper lactate	= Copper lactate
Copper monobromide	= Copper bromide (ous)
Copper naphthenate	= Copper naphthenate
Copper nitrate	= Copper nitrate
Copper orthoarsenite	= Copper arsenite
Copper oxalate	= Copper oxalate
Copper subacetate	= Copper subacetate
Copper sulfate pentahydrate	= Copper sulfate
Copper sulfate, ammoniated	= Copper sulfate, ammoniated
Copper sulfate	= Copper sulfate
Copper tartrate	= Copper tartrate
Copper(II) fluoborate solution	= Copper fluoroborate
Copperas	= Ferrous sulfate
Copra oil	= Oils, edible: coconut
Corflex 880	= Diisooctyl phthalate
Corn sugar solution	= Dextrose solution
Corn syrup	= Corn syrup
Corrosive mercury chloride	= Mercuric chloride
Cosan PMA-100	= Phenylmercuric acetate
Cotoran multi	= Metolachlor
Coumaphos	= Coumaphos
Crankcase oil	= Oils, miscellaneous: lubricating
Crankcase oil	= Oils, miscellaneous: motor
Creosote (wood)	= Creosote (wood)
Creosote oil	= Creosote, coal tar
Creosote, coal tar	= Creosote, coal tar
Creosote	= Creosote (wood)
Cresol, epoxypropyl ether	= Cresyl glycidyl ether
m-Cresol	= m-Cresol

SYNONYM	COMPOUND NAMES
3-Cresol	= m-Cresol
o-Cresol	= o-Cresol
2-Cresol	= o-Cresol
p-Cresol	= p-Cresol
Cresols	= Cresols
Cresyl glycidyl ether	= Cresyl glycidyl ether
Cresylate spent caustic solution	= Cresylate spent caustic solution
Cresylate spent caustic	= Cresylate spent caustic solution
m-Cresylic acid	= m-Cresol
Cresylic acid	= Xylenol
Cresylic acids	= Cresols
o-Cresylphosphate	= Tricresyl phosphate (>= 1% ortho isomer)
Croplas EH	= Ethyl hexyl tallate
Crotenaldehyde	= Crotonaldehyde
Croton oil	= Oils, miscellaneous: croton
Croton tiglium oil	= Oils, miscellaneous: croton
Crotonaldehyde	= Crotonaldehyde
Crotonic aldehyde	= Crotonaldehyde
Crotonol	= Oils, miscellaneous: croton
Crude epichlorohydrin	= Chlorohydrins
Crystallized verdigris	= Copper acetate
CTF	= Chlorine trifluoride
CTFE	= Trifluorochloroethylene
Cucumber dust	= Calcium arsenate
Cumene bottoms	= Diisopropylbenzene (all isomers)
Cumene hydroperoxide	= Cumene hydroperoxide
Cumene	= Cumene
Cumol	= Cumene
Cumyl hydroperoxide	= Cumene hydroperoxide
Cuprammonium sulfate	= Copper sulfate, ammoniated
Cupric acetate monohydrate	= Copper acetate
Cupric acetate, basic	= Copper subacetate
Cupric amino acetate	= Copper glycinate
Cupric ammine sulfate	= Copper sulfate, ammoniated
Cupric arsenite	= Copper arsenite
Cupric bromide, anhydrous	= Copper bromide
Cupric chloride dihydrate	= Copper chloride
Cupric diformate	= Copper formate
Cupric fluoborate solution	= Copper fluoroborate
Cupric green	= Copper arsenite
Cupric nitrate trihydrate	= Copper nitrate
Cupric oxalate hemihydrate	= Copper oxalate
Cupric sulfate	= Copper sulfate
Cupricin	= Copper cyanide (ous)
Cupriethylenediamine hydroxide solution	= Cupriethylenediamine solution
Cupriethylenediamine solution	= Cupriethylenediamine solution
Cuprous cyanide	= Copper cyanide (ous)
Cuprous iodide	= Copper iodide
Curaterr	= Carbofuran
Cyanacetic acid	= Cyanoacetic acid
Cyanide of calcium	= Calcium cyanide
Cyanide of zinc	= Zinc cyanide
Cyanide	= Potassium cyanide

SYNONYM	COMPOUND NAMES
Cyanoacetic acid	= Cyanoacetic acid
Cyanoacetoneitrile	= Propanedinitrile
Cyanobenzene	= Benzonitrile
Cyanoethane	= Propionitrile
2-Cyanoethanol	= Ethylene cyanohydrin
Cyanoethylene	= Acrylonitrile
Cyanogas A-dust	= Calcium cyanide
Cyanogas G-fumigant	= Calcium cyanide
Cyanogen bromide	= Cyanogen bromide
Cyanogen chloride	= Cyanogen chloride
Cyanogen	= Cyanogen
Cyanomethane	= Acetonitrile
Cyanopropane	= Butyronitrile
2-Cyanopropene-1	= Methacrylonitrile
Cyclodan	= Endosulfan
1,5,9-Cyclododecatriene	= 1,5,9-Cyclododecatriene
Cycloheptane	= Cycloheptane
2,5-Cyclohexadiene-1,4-dione	= p-Benzoquinone
1,4-Cyclohexadienedione	= p-Benzoquinone
Cyclohexane	= Cyclohexane
Cyclohexanol	= Cyclohexanol
Cyclohexanone peroxide	= Cyclohexanone peroxide
Cyclohexanone	= Cyclohexanone
Cyclohexanyl acetate	= Cyclohexyl acetate
Cyclohexenyltrichlorosilane	= Cyclohexenyltrichlorosilane
2-Cyclohexyl-4,6-dinitrophenol	= 4,6-Dinitro-o-cyclohexyl phenol
Cyclohexyl acetate	= Cyclohexyl acetate
Cyclohexyl alcohol	= Cyclohexanol
Cyclohexyl ethane	= Ethyl cyclohexane
Cyclohexyl ketone	= Cyclohexanone
Cyclohexylamine, n-ethyl	= N-Ethylcyclohexylamine
Cyclohexylamine, n,n-dimethyl	= N,N-Dimethylcyclohexylamine
Cyclohexylamine	= Cyclohexylamine
N-Cyclohexylethylamine	= N-Ethylcyclohexylamine
Cyclohexylmethane	= Methylcyclohexane
Cyclopentane, methyl	= Methyl cyclopentane
Cyclopentane	= Cyclopentane
Cyclopentene	= Cyclopentene
Cyclopropane	= Cyclopropane
p-Cymene	= p-Cymene
Cymol	= p-Cymene
Cythion insecticide	= Malathion
D-D soil fumigant	= Dichloropropene, dichloropropane mixture
2,4-D esters	= 2,4-D esters
D.D. turpentine	= Turpentine
2,4-D	= 2,4-Dichlorophenoxyacetic acid
Dalapon	= 2,2-Dichloropropanoic acid
Dalmation-insect powder	= Pyrethrins
2,6-DBN	= Dichlobenil
DBP	= Dibutyl phthalate
DCEE	= 2,2-Dichloroethyl ether
DCP	= Calcium phosphate
DDD	= DDD

SYNONYM	COMPOUND NAMES
p,p'-DDT	= DDT
DDT	= DDT
DDVP	= Dichlorvos
DE Kalin	= Decahydronaphthalene
DEA	= Diethanolamine
Dead oil	= Creosote, coal tar
DEAE	= N,N-Diethylethanolamine
Deanol	= Dimethylethanolamine
DEC	= Decahydronaphthalene
Decaborane	= Decaborane
Decachloroketone	= Kepone
Decahydronaphthalene	= Decahydronaphthalene
Decaldehyde	= Decaldehyde
Decalin	= Decahydronaphthalene
Decanal	= Decaldehyde
Bicyclo[4.4.0]Decane	= Decahydronaphthalene
n-Decane	= Decane
Decane	= Decane
1-Decanecarboxylic acid	= Undecanoic acid
n-Decanoic acid	= Decanoic acid
Decanoic acid	= Decanoic acid
1-Decanol	= n-Decyl alcohol
alpha-Decene	= 1-Decene
1-Decene	= 1-Decene
Dechlorane	= Mirex
Decyl acrylate, inhibited	= n-Decyl acrylate
Decyl acrylate	= n-Decyl acrylate
n-Decyl acrylate	= n-Decyl acrylate
n-Decyl alcohol	= n-Decyl alcohol
n-Decyl aldehyde	= Decaldehyde
n-Decylbenzene	= n-Decylbenzene
Decylbenzene	= n-Decylbenzene
Decylbenzenesulfonic acid	= Alkyl(C <sub>11</sub> - C <sub>17</sub> )benzenesulfonic acid
n-Decylic acid	= Decanoic acid
Deep lemon yellow	= Strontium chromate
DEG	= Diethylene glycol
DEHP	= Di-(2-ethylhexyl)phthalate
DEHPA	= Di-(2-ethylhexyl)phosphoric acid
Dehydrite	= Magnesium perchlorate
DEK	= Diethyl ketone
Demeton	= Demeton
DEN	= Diethylamine
Denatured alcohol	= Ethyl alcohol
Detergent alkylate #	= Dodecylbenzene
Detergent HD-90	= Dodecyl benzene sulfonic acid, sodium salt
Dexol stump remover	= Potassium nitrate
Dextrone	= Diquat
Dextrose solution	= Dextrose solution
Di-(2-chloroethyl) ether	= 2,2-Dichloroethyl ether
Di-(2-ethylhexyl) adipate	= Di-(2-ethylhexyl) adipate
Di-(2-ethylhexyl) phosphate	= Di-(2-ethylhexyl)phosphoric acid
Di-(2-ethylhexyl) sulfosuccinate, sodium salt	= Dioctyl sodium sulfosuccinate

SYNONYM	COMPOUND NAMES
Di-(2-ethylhexyl)phosphoric acid	= Di-(2-ethylhexyl)phosphoric acid
Di-(2-ethylhexyl)phthalate	= Di-(2-ethylhexyl)phthalate
Di-(4-chlorobenzoyl) peroxide	= Di-(p-chlorobenzoyl) peroxide
Di-(6-methylheptyl) phthalate	= Diisooctyl phthalate
Di-(p-chlorobenzoyl) peroxide	= Di-(p-chlorobenzoyl) peroxide
Di-(p-chlorophenyl) trichloromethylcarbinol	= 4,4'-dichloro-alpha-trichloromethyl benzhydrol
Di-beta-hydroxyethoxyethane	= Triethylene glycol
Di-n-amyl phthalate	= Di-n-amyl phthalate
Di-n-butyl ether	= Di-n-butyl ether
Di-n-butyl ketone	= Di-n-butyl ketone
Di-n-butylamine	= Di-n-butylamine
Di-n-hexyl adipate	= Di-n-hexyl adipate
Di-n-nonyl phthalate	= Dinonyl phthalate
Di-n-propyl ether	= n-Propyl ether
Di-n-propylamine	= Di-n-propylamine
Di-on	= Diuron
Di-sec-octyl phthalate	= Di-(2-ethylhexyl)phthalate
Di-syston	= Disulfoton
2,6-Di-tert-butylphenol	= Dibutylphenol
Di (2-ethylhexyl) adipate	= Dioctyl adipate
Di (2-ethylhexyl) phthalate	= Dioctyl phthalate
Di(2-hydroxyethyl) amine	= Diethanolamine
Di(7-methyloctyl) phthalate	= Diisononyl phthalate
Di(ethylene oxide)	= 1,4-Dioxane
Diacetic ether	= Ethyl acetoacetate
Diacetone alcohol	= Diacetone alcohol
Diacetone	= Diacetone alcohol
Diacetyl peroxide solution	= Acetyl peroxide solution
Diacetylmethane	= Acetylacetone
1,6-Diamino-2,2,4(or2,4,4)- trimethylhexane	= Trimethyl hexamethylene diamine
1,11-Diamino-3,6,9-triazaundecane	= Tetraethylenepentamine
p,p'-Diaminobiphenyl	= Benzidine
2,2'-Diaminodiethylamine	= Diethylenetriamine
p-Diaminodiphenyl	= Benzidine
1,2-Diaminoethane	= Ethylenediamine
1,2-Diaminoethane	= Ethylenediamine
1,6-Diaminohexane	= Hexamethylenediamine
2,4-Diaminotoluene	= Toluenediamine
Diammonium chromate	= Ammonium chromate
Diammonium citrate	= Ammonium citrate, dibasic
Diammonium hydrogen phosphate	= Ammonium phosphate
Diammonium orthophosphate	= Ammonium phosphate
Diammonium oxalate	= Ammonium oxalate
Diammonium salt of zinc EDTA	= Diammonium salt of zinc EDTA
Diamyl phthalate	= Amyl phthalate
Diamyl phthalate	= Di-n-amyl phthalate
Diantimony trioxide	= Antimony trioxide
Diazinon	= Diazinon
Dibenzo [b,e] pyridine	= Acridine
Dibenzol dipropylene glycol ester	= Dipropylene glycol dibenzoate
Dibenzoyl peroxide	= Dibenzoyl peroxide
Dibenzyl ether	= Dibenzyl ether

SYNONYM	COMPOUND NAMES
DIBK	= Diisobutyl ketone
Dibrom	= Naled
1,2-Dibromo-2,2-dichloroethyl dimethyl phosphate	= Naled
1,2-Dibromoethane	= Ethylene dibromide
sym-Dibromoethane	= Ethylene dibromide
Dibromomethane	= Dibromomethane
1,2-Dibutoxyethane	= Ethylene glycol dibutyl ether
2,2'-Dibutoxyethyl ether	= Diethylene glycol dibutyl ether
Dibutyl carbitol	= Diethylene glycol dibutyl ether
Dibutyl cellosolve	= Ethylene glycol dibutyl ether
n-Dibutyl ether	= Di-n-butyl ether
Dibutyl ether	= Di-n-butyl ether
Dibutyl oxide	= Di-n-butyl ether
Dibutyl phthalate	= Dibutyl phthalate
Dibutylamine	= Di-n-butylamine
Dibutylphenol	= Dibutylphenol
Dicalcium phosphate	= Calcium phosphate
Dicamba	= Dicamba
Dicarbomethoxyzinc	= Zinc acetate
Dichlobenil	= Dichlobenil
Dichlone	= Dichlone
Dichlorfendism	= Diuron
Dichloricide	= p-Dichlorobenzene
1,1-Dichloro-1-nitroethane	= 1,1-Dichloro-1-nitroethane
2,3-Dichloro-1-propane	= 2,3-Dichloropropene
2,3-Dichloro-1,4-naphthoquinone	= Dichlone
cis-1,4-Dichloro-2-butene	= Dichlorobutene
trans-1,4-Dichloro-2-butene	= Dichlorobutene
1,4-Dichloro-2-butene	= Dichlorobutene
1,4-Dichloro-2-butylene	= Dichlorobutene
1,1-Dichloro-2,2-bis(p-chlorophenyl) ethane	= DDD
4,4'-Dichloro-alpha-trichloromethyl benzhydrol	= 4,4'-Dichloro-alpha-trichloromethyl benzhydrol
3,6-Dichloro-o-anisic acid	= Dicamba
Dichloroacetic acid, methyl ester	= Methyl dichloroacetate
meta-Dichlorobenzene	= m-Dichlorobenzene
m-Dichlorobenzene	= m-Dichlorobenzene
1,3-Dichlorobenzene	= m-Dichlorobenzene
o-Dichlorobenzene	= o-Dichlorobenzene
ortho-Dichlorobenzene	= o-Dichlorobenzene
1,2-Dichlorobenzene	= o-Dichlorobenzene
p-Dichlorobenzene	= p-Dichlorobenzene
2,6-Dichlorobenzonitrile	= Dichlobenil
p,p'-Dichlorobenzoyl peroxide	= Di-(p-chlorobenzoyl) peroxide
Dichlorobutene	= Dichlorobutene
Dichlorodiethyl ether	= 2,2-Dichloroethyl ether
Dichlorodifluoromethane	= Dichlorodifluoromethane
Dichlorodiphenyldichloroethane	= DDD
Dichlorodiphenylsilane	= Diphenyldichlorosilane
Dichlorodiphenylsilane	= Diphenyldichlorosilane
Dichlorodiphenyltrichloroethane	= DDT
1,1-Dichloroethane	= 1,1-Dichloroethane

SYNONYM	COMPOUND NAMES
1,2-Dichloroethane	= Ethylene dichloride
Dichloroether	= 2,2-Dichloroethyl ether
2,2-Dichloroethyl ether	= 2,2-Dichloroethyl ether
trans-1,2-Dichloroethylene	= 1,2-Dichloroethylene
sym-Dichloroethylene	= 1,2-Dichloroethylene
cis-1,2-Dichloroethylene	= 1,2-Dichloroethylene
1,2-Dichloroethylene	= 1,2-Dichloroethylene
1,1-Dichloroethylene	= Vinylidene chloride
unsym-Dichloroethylene	= Vinylidene chloride
Dichlorofluoromethane	= Dichloromonofluoromethane
1,6-Dichlorohexane	= 1,6-Dichlorohexane
2,2'-Dichloroisopropyl ether	= 2,2'-Dichloroisopropyl ether
2,2'-Dichloroisopropyl ether	= 2,2'-Dichloroisopropyl ether
Dichloromethane	= Dichloromethane
Dichloromonofluoromethane	= Dichloromonofluoromethane
2,4-Dichlorophenol	= 2,4-Dichlorophenol
2,4-Dichlorophenoxyacetic acid, butoxyethyl ester	= 2,4-D esters
2,4-Dichlorophenoxyacetic acid	= 2,4-Dichlorophenoxyacetic acid
Dichlorophenylphosphine	= Benzene phosphorus dichloride
Dichlorophos	= Dichlorvos
1,1-Dichloropropane	= 1,1-Dichloropropane
1,2-Dichloropropane	= 1,2-Dichloropropane
Dichloropropane	= 1,2-Dichloropropane
1,3-Dichloropropane	= 1,3-Dichloropropane
2,2-Dichloropropanoic acid	= 2,2-Dichloropropanoic acid
1,3-Dichloropropene and 1,2- Dichloropropane	= Dichloropropene, dichloropropane mixture
Dichloropropene, dichloropropane mixture	= Dichloropropene, dichloropropane mixture
1,3-Dichloropropene	= 1,3-Dichloropropene
Dichloropropene	= 1,3-Dichloropropene
2,3-Dichloropropene	= 2,3-Dichloropropene
2,2-Dichloropropionic acid	= 2,2-Dichloropropanoic acid
2,3-Dichloropropylene	= 2,3-Dichloropropene
Dichlorotetrafluoroethane	= Dichlorotetrafluoroethane
1,2-Dichlorotetrafluoroethane	= Dichlorotetrafluoroethane
2,2-Dichlorovinyl O,O-dimethyl phosphate	= Dichlorvos
Dichlorvos	= Dichlorvos
Dichromium sulfate	= Chromic sulfate
Dichromium trisulfate	= Chromic sulfate
Dicofol	= 4,4'-Dichloro-alpha-trichloromethyl benzhydrol
Dicy	= Dicyclopentadiene
Dicyan	= Cyanogen
1,4-Dicyanobutane	= Adiponitrile
Dicyanogen	= Cyanogen
Dicyclohexanone diperoxide	= Cyclohexanone peroxide
Dicyclopentadiene	= Dicyclopentadiene
Dieldrin	= Dieldrin
Diesel ignition improver	= n-Amyl nitrate
Diesel oil (light)	= Oils, fuel: 1-D
Diesel oil, medium	= Oils, fuel: 2-D

SYNONYM	COMPOUND NAMES
Diethanolamine lauryl sulfate solution	= Dodecyl sulfate, diethanolamine salt
Diethanolamine	= Diethanolamine
Diethion	= Ethion
1,1-Diethoxyethane	= Acetal
1,2-Diethoxyethane	= Ethylene glycol diethyl ether
O,O-Diethyl-5-2-(ethylthio)ethyl phosphodithioate	= Disulfoton
O,O-Diethyl-O-(3-chloro-4-methyl-2-oxo- (2h)-1-benzopyran-7-yl) phosphorothioate	= Coumaphos
Diethyl "cellosolve"	= Ethylene glycol diethyl ether
Diethyl acetal	= Acetal
Diethyl carbonate	= Diethyl carbonate
Diethyl ether	= Ethyl ether
Diethyl ketone	= Diethyl ketone
O,O-Diethyl O-(2-isopropyl-6-methyl-4- pyrimidinyl)phosphorothioate	= Diazinon
Diethyl oxide	= Ethyl ether
Diethyl phthalate	= Diethyl phthalate
Diethyl sulfate	= Diethyl sulfate
Diethyl sulphate	= Diethyl sulfate
Diethylamine	= Diethylamine
2-N-Diethylaminoethanol	= N,N-Diethylethanolamine
Diethylaminoethanol	= N,N-Diethylethanolamine
2,6-Diethylaniline	= 2,6-Diethylaniline
Diethylbenzene	= Diethylbenzene
Diethylene glycol di-n-butyl ether	= Diethylene glycol dibutyl ether
Diethylene glycol dibutyl ether	= Diethylene glycol dibutyl ether
Diethylene glycol dimethyl ether	= Diethylene glycol dimethyl ether
Diethylene glycol ethyl ether acetate	= Diethylene glycol ethyl ether acetate
Diethylene glycol ethyl ether	= Diethylene glycol monoethyl ether
Diethylene glycol methyl ether acetate	= Diethylene glycol methyl ether acetate
Diethylene glycol methyl ether	= Diethylene glycol monomethyl ether
Diethylene glycol monobutyl ether acetate	= Diethylene glycol monobutyl ether acetate
Diethylene glycol monobutyl ether	= Diethylene glycol monobutyl ether
Diethylene glycol monoethyl ether	= Diethylene glycol monoethyl ether
Diethylene glycol monomethyl ether	= Diethylene glycol monomethyl ether
Diethylene glycol n-hexyl ether	= Diethylene glycol n-hexyl ether
Diethylene glycol phthalate	= Diethylene glycol phthalate
Diethylene glycol	= Diethylene glycol
Diethylene imidoxide	= Morpholine
Diethylene oxide	= Tetrahydrofuran
Diethylene oximide	= Morpholine
Diethylenediamine	= Piperazine
Diethyleneimide oxide	= Morpholine
Diethylenetriamine	= Diethylenetriamine
N,N-Diethylethanolamine	= N,N-Diethylethanolamine
Diethylzinc	= Diethylzinc
Dieyanomethane	= Propanedinitrile
1,1-Difluoroethane	= 1,1-Difluoroethane
Difluorophosphoric acid	= Difluorophosphoric acid
Difluorophosphorus acid	= Difluorophosphoric acid
Diformyl	= Glyoxal



SYNONYM	COMPOUND NAMES
Diglycidyl ether of Bisphenol A	= Bisphenol A diglycidyl ether
Diglycol monobutyl ether acetate	= Diethylene glycol monobutyl ether acetate
Diglycol monobutyl ether	= Diethylene glycol monobutyl ether
Diglycol	= Diethylene glycol
Diglyme	= Diethylene glycol dimethyl ether
Diheptyl phthalate	= Diheptyl phthalate
1,2-Dihydro-3,6-pyridazinedione	= Maleic hydrazide
2,5-Dihydroperoxy-2,5-dimethylhexane	= Dimethylhexane dihydroperoxide
1,4-Dihydroxy-2-butene	= 1,4-Butenediol
1,4-Dihydroxy-2-butyne	= 1,4-Butynediol
2,2-Dihydroxy-3,3,5,5,6,6-hexachlorodiphenylmethane	= Hexachlorophene
1,2-Dihydroxybenzene	= Catechol
p-Dihydroxybenzene	= Hydroquinone
1,3-Dihydroxybenzene	= Resorcinol
m-Dihydroxybenzene	= Resorcinol
Dihydroxybenzol	= Resorcinol
1,4-Dihydroxybutane	= 1,4-Butanediol
Dihydroxybutane	= Butylene glycol
2,2'-Dihydroxydiethyl amine	= Diethanolamine
p,p'-Dihydroxydiphenyldimethylmethane	= Bisphenol A
2,2'-Dihydroxydipropylamine	= Diisopropanolamine
1,2-Dihydroxyethane	= Ethylene glycol
1,2-Dihydroxypropane	= Propylene glycol
Diisobutyl ketone	= Diisobutyl ketone
Diisobutyl phthalate	= Diisobutyl phthalate
Diisobutylamine	= Diisobutylamine
Diisobutylcarbinol	= Diisobutylcarbinol
Diisobutylene	= Diisobutylene
Diisodecyl phthalate	= Diisodecyl phthalate
Diisononyl adipate	= Diisononyl adipate
Diisononyl phthalate	= Diisononyl phthalate
Diisooctyl phthalate	= Diisooctyl phthalate
Diisopropanolamine	= Diisopropanolamine
Diisopropyl ether	= Isopropyl ether
Diisopropyl naphthalene	= Diisopropyl naphthalene
2,6-Diisopropyl naphthalene	= Diisopropyl naphthalene
Diisopropyl oxide	= Isopropyl ether
Diisopropyl percarbonate	= Isopropyl percarbonate
Diisopropyl peroxydicarbonate	= Isopropyl percarbonate
5-Diisopropylacetone	= Diisobutyl ketone
Diisopropylamine	= Diisopropylamine
Diisopropylbenzene (all isomers)	= Diisopropylbenzene (all isomers)
Diisopropylbenzene hydroperoxide	= Diisopropylbenzene hydroperoxide
Dilauroyl peroxide	= Lauroyl peroxide
Dilithium chromate	= Lithium chromate
Dilute sulfuric acid	= Sulfuric acid, spent
Dimazine	= 1,1-Dimethylhydrazine
1,2-Dimethoxyethane	= Ethylene glycol dimethyl ether
Dimethoxymethane	= Methyl formal
10,11-Dimethoxystrychnine	= Brucine
Dimethyl-1-hexanols	= Isooctyl alcohol
3,3-Dimethyl-2-methylene norcamphane	= Camphene

SYNONYM	COMPOUND NAMES
2,2-Dimethyl-3-methylene norborane	= Camphene
2,6-Dimethyl-4-heptane	= Diisobutyl ketone
2,6-Dimethyl-4-heptanol	= Diisobutylcarbinol
N,N-Dimethyl-n-(2-hydroxyethyl) amine	= Dimethylethanolamine
alpha, alpha-Dimethyl-propionic acid	= Trimethylacetic acid
N,N-Dimethyl acetamide solution (40% or less)	= N,N-Dimethyl acetamide solution (40% or less)
Dimethyl acetone	= Diethyl ketone
Dimethyl adipate	= Dimethyl adipate
N,N-Dimethyl benzene methanamine	= Benzyl dimethylamine
N,N-Dimethyl benzylamine	= Benzyl dimethylamine
Dimethyl carbamic chloride	= N,N-Dimethylcarbamoyl chloride
Dimethyl cellosolve	= Ethylene glycol dimethyl ether
Dimethyl ether	= Dimethyl ether
Dimethyl formal	= Methyl formal
Dimethyl glutarate	= Dimethyl glutarate
Dimethyl hexanedioate	= Dimethyl adipate
Dimethyl hydrogen phosphite	= Dimethyl hydrogen phosphite
Dimethyl ketone	= Acetone
O,O-Dimethyl o-p-nitrophenyl thiophosphate	= Methyl parathion
2,2-Dimethyl octanoic acid	= Neodecanoic acid
Dimethyl phosphite	= Dimethyl hydrogen phosphite
Dimethyl phthalate	= Dimethyl phthalate
O,O-Dimethyl s-[(4-oxo-1,2,3-benzotriazine-3-(4h)-yl)methyl]phosphorodithioate	= Azinphos methyl
Dimethyl silicone fluids	= Dimethylpolysiloxane
Dimethyl silicone oil	= Dimethylpolysiloxane
Dimethyl succinate	= Dimethyl succinate
Dimethyl sulfate	= Dimethyl sulfate
Dimethyl sulfide	= Dimethyl sulfide
Dimethyl sulfoxide	= Dimethyl sulfoxide
Dimethyl terephthalate	= Dimethyl terephthalate
N,N-(Dimethyl) a-tolueneamine	= Benzyl dimethylamine
N,N-Dimethylacetamide	= Dimethylacetamide
Dimethylacetamide	= Dimethylacetamide
Dimethylacetamide	= N,N-Dimethyl acetamide solution (40% or less)
Dimethylacetic acid	= Isobutyric acid
Dimethylacetylenecarbinol	= 2-Methyl-2-hydroxy-3-butyne
Dimethylamine	= Dimethylamine
2-(Dimethylamino)ethanol	= Dimethylethanolamine
a-(Dimethylamino)toluene	= Benzyl dimethylamine
B-Dimethylaminoethyl alcohol	= Dimethylethanolamine
2,6-Dimethylaniline	= 2,6-Dimethylaniline
Dimethylarsinic acid	= Cacodylic acid
alpha, alpha-Dimethylbenzene hydroperoxide	= Cumene hydroperoxide
1,3-Dimethylbenzene	= m-Xylene
1,2-Dimethylbenzene	= o-Xylene
1,4-Dimethylbenzene	= p-Xylene
Dimethylbenzyl hydroperoxide	= Cumene hydroperoxide
2,2-Dimethylbutane	= Neohexane

SYNONYM	COMPOUND NAMES
2,2-Dimethylcaprylic acid	= 2,2-Dimethyloctanoic acid
N,N-Dimethylcarbamoyl chloride	= N,N-Dimethylcarbamoyl chloride
Dimethylcarbamylochloride	= N,N-Dimethylcarbamoyl chloride
Dimethylcarbinol	= Isopropyl alcohol
N,N-Dimethylchloroformamide	= N,N-Dimethylcarbamoyl chloride
n-Dimethylcyclohexanamine	= N,N-Dimethylcyclohexylamine
N,N-Dimethylcyclohexylamine	= N,N-Dimethylcyclohexylamine
Dimethyldichlorosilane	= Dimethyldichlorosilane
Dimethylethanolamine	= Dimethylethanolamine
1,1-Dimethylethylamine	= tert-Butylamine
Dimethylethynylcarbinol	= 2-Methyl-2-hydroxy-3-butyne
N,N-Dimethylformamide	= Dimethylformamide
Dimethylformamide	= Dimethylformamide
Dimethylhexanals	= Isooctaldehyde
2,5-Dimethylhexane-2,5-dihydroperoxide	= Dimethylhexane dihydroperoxide
Dimethylhexane dihydroperoxide	= Dimethylhexane dihydroperoxide
1,1-Dimethylhydrazine	= 1,1-Dimethylhydrazine
unsym-Dimethylhydrazine	= 1,1-Dimethylhydrazine
sym-Dimethylhydrazine	= 1,2-Dimethylhydrazine
1,2-Dimethylhydrazine	= 1,2-Dimethylhydrazine
Dimethylmethane	= Propane
2,2-Dimethyloctanoic acid	= 2,2-Dimethyloctanoic acid
Dimethylol propane	= 2,2-Dimethylpropane-1,3-diol
Dimethylphenol phosphate (3:1)	= Trixylenyl phosphate
Dimethylphenol	= Xylenol
Dimethylphosphonate	= Dimethyl hydrogen phosphite
Dimethylpolysiloxane	= Dimethylpolysiloxane
2,2-Dimethylpropane-1,3-diol	= 2,2-Dimethylpropane-1,3-diol
1,1-Dimethylpropargyl alcohol	= 2-Methyl-2-hydroxy-3-butyne
Bis(Dimethylthiocarbamyl)disulfide	= Thiram
Dimethyltrimethylene glycol	= 2,2-Dimethylpropane-1,3-diol
Dimethylzinc	= Dimethylzinc
2,4-Dinitraniline	= 2,4-Dinitroaniline
2,4-Dinitro-6-cyclohexylphenol	= 4,6-Dinitro-o-cyclohexyl phenol
2,6-Dinitro-n,n-dipropyl-4-trifluoromethylaniline	= Trifluralin
3,5-Dinitro-o-cresol	= Dinitrocresol
2,6-Dinitro-o-cresol	= Dinitrocresol
4,6-Dinitro-o-cresol	= Dinitrocresol
4,6-Dinitro-o-cyclohexyl phenol	= 4,6-Dinitro-o-cyclohexyl phenol
Dinitro-o-cyclohexylphenol	= 4,6-Dinitro-o-cyclohexyl phenol
2,4-Dinitroaniline	= 2,4-Dinitroaniline
m-Dinitrobenzene	= m-Dinitrobenzene
1,3-Dinitrobenzene	= m-Dinitrobenzene
meta-Dinitrobenzene	= m-Dinitrobenzene
o-Dinitrobenzene	= o-Dinitrobenzene
1,2-Dinitrobenzene	= o-Dinitrobenzene
1,4-Dinitrobenzene	= p-Dinitrobenzene
p-Dinitrobenzene	= p-Dinitrobenzene
1,3-Dinitrobenzol	= m-Dinitrobenzene
Dinitrobenzol	= m-Dinitrobenzene
o-Dinitrobenzol	= o-Dinitrobenzene
Dinitrocresol	= Dinitrocresol
Dinitrogen monoxide	= Nitrous oxide

SYNONYM	COMPOUND NAMES
Dinitrogen tetroxide	= Nitrogen tetroxide
2,4-Dinitrophenol	= 2,4-Dinitrophenol
alpha-Dinitrophenol	= 2,4-Dinitrophenol
2,5-Dinitrophenol	= 2,5-Dinitrophenol
gamma-Dinitrophenol	= 2,5-Dinitrophenol
beta-Dinitrophenol	= 2,6-Dinitrophenol
2,6-Dinitrophenol	= 2,6-Dinitrophenol
o-o-Dinitrophenol	= 2,6-Dinitrophenol
2,4-Dinitrotoluene	= 2,4-Dinitrotoluene
2,6-Dinitrotoluene	= 2,6-Dinitrotoluene
3,4-Dinitrotoluene	= 3,4-Dinitrotoluene
2,4-Dinitrotoluol	= 2,4-Dinitrotoluene
Dinonyl 1,2-benzenedicarboxylate	= Dinonyl phthalate
Dinonyl phthalate	= Dinonyl phthalate
Diocetyl adipate	= Diocetyl adipate
Diocetyl phthalate	= Diocetyl phthalate
Diocetyl sodium sulfosuccinate	= Diocetyl sodium sulfosuccinate
Dioform	= 1,2-Dichloroethylene
Dioxane	= 1,4-Dioxane
p-Dioxane	= 1,4-Dioxane
1,4-Dioxane	= 1,4-Dioxane
Dioxonium perchlorate solution	= Perchloric acid
1,3-Dioxophthalan	= Phthalic anhydride
DIPB	= Diisopropylbenzene (all isomers)
Dipentene	= Dipentene
Dipentyl phthalate	= Amyl phthalate
Dipentyl phthalate	= Di-n-amyl phthalate
Diphenyl-diphenyl ether mixture	= Dowtherm
Diphenyl ether	= Diphenyl ether
Diphenyl ketone	= Benzophenone
Diphenyl methanone	= Benzophenone
Diphenyl oxide	= Diphenyl ether
Diphenyl	= Diphenyl
Diphenylamine	= Diphenylamine
Diphenyldichlorosilane	= Diphenyldichlorosilane
Diphenylmethane-4,4'-diisocyanate	= Diphenylmethane diisocyanate
Diphenylmethane diisocyanate	= Diphenylmethane diisocyanate
Diphenylsilicon dichloride	= Diphenyldichlorosilane
Dipropandiol dibenzoate	= Dipropylene glycol dibenzoate
Dipropyl ether	= n-Propyl ether
N,N-Dipropylaniline	= Nitralin
Dipropylene glycol dibenzoate	= Dipropylene glycol dibenzoate
Dipropylene glycol methyl ether	= Dipropylene glycol methyl ether
Dipropylene glycol monomethyl ether	= Dipropylene glycol methyl ether
Dipropylene glycol	= Dipropylene glycol
Dipterex	= Trichlorfon
Diquat dibromide	= Diquat
Diquat	= Diquat
Disodium arsenate heptahydrate	= Sodium arsenate
Disodium dihydrogen pyrophosphate	= Sodium phosphate
Disodium ethylenebis[dithiocarbamate]	= Nabam
Disodium methane arsonate	= Methanearsonic acid, sodium salt
Disodium methyl arsonate	= Methanearsonic acid, sodium salt
Disodium nitrilotriacetate	= Nitrilotriacetic acid and salts

SYNONYM	COMPOUND NAMES
Disodium selenite	= Sodium selenite
Distillates: flashed feed stocks	= Distillates: flashed feed stocks
Distillates: straight run	= Distillates: straight run
Distokal	= Hexachloroethane
Distopan	= Hexachloroethane
Disulfatozirconic acid	= Zirconium sulfate
Disulfoton	= Disulfoton
Dithallium carbonate	= Thallium carbonate
Dithane	= Nabam
Dithiopyrophosphoric acid, O,O,O,O-tetraethyl ester	= Tetraethyl dithiopyrophosphate
Dithiosystox	= Disulfoton
Ditridecyl phthalate	= Ditridecyl phthalate
Diundecyl phthalate	= Diundecyl phthalate
Diurex	= Diuron
Diuron	= Diuron
Divinyl	= Butadiene
Divinylene oxide	= Furan
divinylmethane	= 1,4-Pentadiene
DMCC	= N,N-Dimethylcarbamoyl chloride
DMDT	= Methoxychlor
DMF	= Dimethylformamide
DMP	= Dimethyl phthalate
DMS	= Dimethyl sulfide
DMSO	= Dimethyl sulfoxide
m-DNB	= m-Dinitrobenzene
2,5-DNP	= 2,5-Dinitrophenol
DNP	= 2,6-Dinitrophenol
DNT	= 2,4-Dinitrotoluene
2,6-DNT	= 2,6-Dinitrotoluene
3,4-DNT	= 3,4-Dinitrotoluene
DO 14	= Propargite
DOA	= Dioctyl adipate
1-Dodecanethiol	= Lauryl mercaptan
n-Dodecanoic acid	= Lauric acid
Dodecanol	= Dodecanol
Dodecanol	= Linear alcohols
Dodecanoyl peroxide	= Lauroyl peroxide
Dodecene (non-linear)	= Dodecene
Dodecene (non-linear)	= Propylene tetramer
1-Dodecene	= 1-Dodecene
Dodecene	= Dodecene
Dodecyl-2-methyl-2-propenoate	= Dodecylmethacrylate
Dodecyl alcohol	= Dodecanol
Dodecyl benzene sulfonic acid, sodium salt	= Dodecyl benzene sulfonic acid, sodium salt
Dodecyl diphenyl ether disulfonate solution	= Dodecyl diphenyl ether disulfonate solution
Dodecyl diphenyl ether sulfonate, disodium salt, aqueous solution	= Dodecyl diphenyl ether disulfonate solution
Dodecyl mercaptan	= Lauryl mercaptan
Dodecyl phenol	= Dodecyl phenol
Dodecyl sulfate, ammonium salt	= Ammonium lauryl sulfate
Dodecyl sulfate, diethanolamine salt	= Dodecyl sulfate, diethanolamine salt

SYNONYM	COMPOUND NAMES
Dodecyl sulfate, magnesium salt	= Dodecyl sulfate, magnesium salt
Dodecyl sulfate, sodium salt	= Dodecyl sulfate, sodium salt
Dodecyl sulfate, triethanolamine salt	= Dodecyl sulfate, triethanolamine salt
Dodecyl/pentadecyl methacrylate	= Dodecyl/pentadecyl methacrylate
Dodecylbenzene	= Dodecylbenzene
n-Dodecylbenzene	= Dodecylbenzene
n-Dodecylbenzene	= Dodecylbenzene
Dodecylbenzenesulfonate sodium salt	= Dodecyl benzene sulfonic acid, sodium salt
Dodecylbenzenesulfonic acid, calcium salt	= Dodecylbenzenesulfonic acid, calcium salt
Dodecylbenzenesulfonic acid, isopropylamine salt	= Dodecylbenzenesulfonic acid, isopropylamine salt
Dodecylbenzenesulfonic acid, triethanolamine salt	= Dodecylbenzenesulfonic acid, triethanolamine salt
Dodecylbenzenesulfonic acid	= Dodecylbenzenesulfonic acid
alpha-Dodecylene	= 1-Dodecene
Dodecylethylene	= 1-Tetradecene
Dodecylmethacrylate	= Dodecylmethacrylate
Dodecyltrichlorosilane	= Dodecyltrichlorosilane
DOP	= Dioctyl phthalate
Dormant oil	= Oils, miscellaneous: spray
Dow-fume 40	= Ethylene dibromide
Dowanol-50B	= Dipropylene glycol methyl ether
Dowanol 33B	= Propylene glycol methyl ether
Dowanol DB	= Diethylene glycol monobutyl ether
Dowanol DE	= Diethylene glycol monoethyl ether
Dowanol DM	= Diethylene glycol monomethyl ether
Dowanol DPM	= Dipropylene glycol methyl ether
Dowanol EB	= Ethylene glycol monobutyl ether
Dowanol EE	= 2-Ethoxyethanol
Dowanol EE	= Ethylene glycol monoethyl ether
Dowanol eipat	= Ethylene glycol isopropyl ether
Dowanol EM	= Ethylene glycol monomethyl ether
Dowanol EP	= Ethylene glycol phenyl ether
Dowanol EPH	= Ethylene glycol phenyl ether
Dowanol PM	= Propylene glycol methyl ether
Dowanol TE	= Ethoxy triglycol
Dowanol TPM	= Tripropylene glycol methyl ether
Dowco 179	= Dursban
Dowfax 2A1	= Dodecyl diphenyl ether disulfonate solution
Dowfume N	= Dichloropropene, dichloropropane mixture
Dowicide 2	= Trichlorophenol
Dowicide 7	= Pentachlorophenol
Dowtherm A	= Dowtherm
Dowtherm e	= o-Dichlorobenzene
Dowtherm	= Dowtherm
Dracyclic acid	= Benzoic acid
Dri-tri	= Sodium phosphate, tribasic
Drycleaner naphtha	= Naphtha: stoddard solvent
Drying oil epoxides	= Epoxidized vegetable oils
DSMA	= Methanearsonic acid, sodium salt

SYNONYM	COMPOUND NAMES
DTDP	= Ditridecyl phthalate
Du-sprex	= Dichlobenil
Dual	= Metolachlor
Duodecyllic acid	= Lauric acid
Duodex	= Sodium 2-mercaptobenzothiazol solution
Dursban	= Dursban
Dust-laying oil	= Asphalt blending stocks: roofers flux
Dutch liquid	= Ethylene dichloride
Dylox	= Trichlorfon
Dytol S-91	= n-Decyl alcohol
E3314	= Heptachlor
EAA	= Ethyl acetoacetate
EADC	= Ethylaluminum dichloride
EASC	= Ethylaluminum sesquichloride
EB	= Ethylbenzene
EBDC, sodium salt	= Nabam
Ecrinitrit	= Sodium nitrite
EDC	= Ethylene dichloride
Edible tallow	= Tallow
EDTA-zinc complex	= Diammonium salt of zinc EDTA
EDTA-zinc	= Diammonium salt of zinc EDTA
EDTA zinc salt	= Diammonium salt of zinc EDTA
EDTA	= Ethylenediamine tetracetic acid
Egitol	= Hexachloroethane
Ektasolve DB acetate	= Diethylene glycol monobutyl ether acetate
Ektasolve EP	= Ethylene glycol propyl ether
Electrical insulating oil	= Oils, miscellaneous: transformer
Embafume	= Methyl bromide
Emerald green	= Copper acetoarsenite
Emerssence 1160	= Ethylene glycol phenyl ether
Emery 6705	= Ethylene glycol phenyl ether
Enanthic acid	= Heptanoic acid
Enanthic alcohol	= Heptanol
Endosulfan	= Endosulfan
Endrate	= Ethylenediamine tetracetic acid
Endrin	= Endrin
ENT-16391	= Kepone
ENT 25,719	= Mirex
ENT 262	= Dimethyl phthalate
ENT 27,311	= Dursban
Epichlorohydrin resin	= Bisphenol A diglycidyl ether
Epichlorohydrin	= Epichlorohydrin
Epoxidized drying oils	= Epoxidized vegetable oils
Epoxidized oils	= Epoxidized vegetable oils
Epoxidized tall oil, octyl ester	= Octyl epoxy tallate
Epoxidized vegetable oils	= Epoxidized vegetable oils
1,2-Epoxy-3-butoxy propane	= n-Butyl glycidyl ether
1,2-Epoxybutane	= 1,2-Butylene oxide
1,2-Epoxyethane	= Ethylene oxide
1,2-Epoxypropane	= Propylene oxide
2,3-Epoxypropyl butyl ether	= n-Butyl glycidyl ether
Eriochalcite (anhydrous)	= Copper chloride
Eskimon-22	= Chlorodifluoromethane

SYNONYM	COMPOUND NAMES
Eskimon 11	= Trichlorofluoromethane
Eskimon 12	= Dichlorodifluoromethane
Essence of mirbane	= Nitrobenzene
Essence of Niobe	= Methyl benzoate
Ethanal, trichloro-	= Trichloroacetaldehyde
Ethanal	= Acetaldehyde
Ethane dinitrile	= Cyanogen
Ethane hexachloride	= Hexachloroethane
Ethane pentachloride	= Pentachloroethane
Ethane, 1,1,2-trichloro- 1,2,2-trifluoro-	= 1,1,2-Trichloro-1,2,2-trifluoroethane
Ethane, 1,1,2-trichloro-	= 1,1,2-Trichloroethane
Ethane, 1,2-dibutoxy	= Ethylene glycol dibutyl ether
Ethane, pentachloro-	= Pentachloroethane
Ethane	= Ethane
Ethancarboxylic acid	= Propionic acid
Ethanedial	= Glyoxal
1,2-Ethanediamine	= Ethylenediamine
1,2-Ethanediamine	= Ethylenediamine
Ethanedioic acid, disodium salt	= Sodium oxalate
Ethanedioic acid	= Oxalic acid
1,2-Ethanediol, monoacetate	= Ethylene glycol acetate
1,2-Ethanediol	= Ethylene glycol
Ethanenitrile	= Acetonitrile
Ethanethiol	= Ethyl mercaptan
Ethanoic acid	= Acetic acid
Ethanoic anhydride	= Acetic anhydride
Ethanol, 2-isopropoxy	= Ethylene glycol isopropyl ether
Ethanol	= Ethyl alcohol
Ethanolamine	= Monoethanolamine
Ethanoyl chloride	= Acetyl chloride
Ethene	= Ethylene
Ether cyanatus	= Propionitrile
Ether ethylene glycol dibutyl	= Ethylene glycol dibutyl ether
Ether, bis(2-chloro-1-methylethyl)	= 2,2'-Dichloroisopropyl ether
Ether, hydrochloric	= Ethyl chloride
Ether, vinyl ethyl	= Vinyl ethyl ether
Ether	= Ethyl ether
Ethine	= Acetylene
Ethion	= Ethion
Ethiops mineral	= Mercuric sulfide
1-Ethoxy-2-propanol	= Propylene glycol ethyl ether
2-Ethoxy-3,4-dihydro-2h-pyran	= Ethoxydihdropyran
Ethoxy diglycol	= Diethylene glycol monoethyl ether
Ethoxy propionic acid, ethyl ester	= Ethyl-3-ethoxypropionate
Ethoxy triglycol	= Ethoxy triglycol
Ethoxydihdropyran	= Ethoxydihdropyran
Ethoxyethane	= Ethyl ether
2-Ethoxyethanol	= 2-Ethoxyethanol
2-Ethoxyethanol	= Ethylene glycol monoethyl ether
2-(2-Ethoxyethoxy) ethanol	= Diethylene glycol monoethyl ether
2-Ethoxyethyl acetate	= 2-Ethoxyethyl acetate
2-Ethoxyethyl acetate	= Ethylene glycol monoethyl ether acetate
Ethoxylated dodecanol	= Ethoxylated dodecanol
Ethoxylated dodecyl alcohol	= Ethoxylated dodecanol



SYNONYM	COMPOUND NAMES
Ethoxylated lauryl alcohol	= Ethoxylated dodecanol
Ethoxylated myristyl alcohol	= Ethoxylated tetradecanol
Ethoxylated nonylphenol	= Ethoxylated nonylphenol
Ethoxylated pentadecanol	= Ethoxylated pentadecanol
Ethoxylated pentadecylalcohol	= Ethoxylated pentadecanol
Ethoxylated tetradecanol	= Ethoxylated tetradecanol
Ethoxylated tetradecyl alcohol	= Ethoxylated tetradecanol
Ethoxylated tridecanol	= Ethoxylated tridecanol
Ethoxylated tridecyl alcohol	= Ethoxylated tridecanol
Ethoxytriethylene glycol	= Ethoxy triglycol
2-Ethyl-1-hexanol hydrogen phosphate	= Di-(2-ethylhexyl)phosphoric acid
2-Ethyl-1-hexanol	= 2-Ethyl hexanol
2-Ethyl-1-hexylamine	= 2-Ethylhexylamine
2-Ethyl-2-hexenal	= 2-Ethyl-3-propylacrolein
5-Ethyl-2-methyl pyridine	= Methylethylpyridine
6-Ethyl-2-methylaniline	= 2-Methyl-6-ethyl aniline
1-Ethyl-2-methylbenzene	= 2-Ethyl toluene
5-Ethyl-2-picoline	= Methylethylpyridine
Ethyl-3-ethoxypropionate	= Ethyl-3-ethoxypropionate
2-Ethyl-3-propylacrolein	= 2-Ethyl-3-propylacrolein
2-Ethyl-3-propylacrylaldehyde	= 2-Ethyl-3-propylacrolein
2-Ethyl-1-butanol	= Ethyl butanol
N-Ethyl-n-butylamine	= N-Ethyl-n-butylamine
6-Ethyl-o-toluidine	= 2-Methyl-6-ethyl aniline
Ethyl 2-hydroxypropanoate	= Ethyl lactate
Ethyl 2-hydroxypropionate	= Ethyl lactate
Ethyl 2-methacrylate	= Ethyl methacrylate
Ethyl 2-methyl-2-propenoate	= Ethyl methacrylate
Ethyl 2-propenoate	= Ethyl acrylate
Ethyl 3-oxobutanoate	= Ethyl acetoacetate
Ethyl acetate	= Ethyl acetate
Ethyl acetoacetate	= Ethyl acetoacetate
Ethyl acetone	= 2-Pentanone
Ethyl acrylate	= Ethyl acrylate
Ethyl alcohol	= Ethyl alcohol
Ethyl aldehyde	= Acetaldehyde
Ethyl alpha-hydroxypropionate	= Ethyl lactate
Ethyl alpha-methylmethacrylate	= Ethyl methacrylate
Ethyl amyl ketone	= Ethyl amyl ketone
Ethyl beta-ethoxypropionate	= Ethyl-3-ethoxypropionate
Ethyl butanoate	= Ethyl butyrate
Ethyl butanol	= Ethyl butanol
Ethyl butyl ketone	= Ethyl butyl ketone
Ethyl butyrate	= Ethyl butyrate
Ethyl carbonate	= Diethyl carbonate
Ethyl chloracetate	= Ethyl chloroacetate
Ethyl chloride	= Ethyl chloride
Ethyl chloroacetate	= Ethyl chloroacetate
Ethyl chlorocarbonate	= Ethyl chloroformate
Ethyl chloroethanoate	= Ethyl chloroacetate
Ethyl chloroformate	= Ethyl chloroformate
Ethyl chlorothioformate	= Ethyl chlorothioformate
Ethyl chlorothiolformate	= Ethyl chlorothioformate
Ethyl cyclohexane	= Ethyl cyclohexane

SYNONYM	COMPOUND NAMES
Ethyl dichlorophosphate	= Ethyl phosphorodichloridate
Ethyl dl-lactate	= Ethyl lactate
Ethyl ethanoate	= Ethyl acetate
Ethyl ether	= Ethyl ether
Ethyl formate	= Ethyl formate
Ethyl formic ester	= Ethyl formate
2-Ethyl hexaldehyde	= Ethylhexaldehyde
2-Ethyl hexanol	= 2-Ethyl hexanol
Ethyl hexyl phthalate	= Ethyl hexyl phthalate
Ethyl hexyl tallate	= Ethyl hexyl tallate
Ethyl lactate	= Ethyl lactate
Ethyl mercaptan	= Ethyl mercaptan
Ethyl methacrylate-inhibited	= Ethyl methacrylate
Ethyl methacrylate	= Ethyl methacrylate
Ethyl methanoate	= Ethyl formate
Ethyl methyl ketone	= Methyl ethyl ketone
n-Ethyl morpholine	= n-Ethyl morpholine
Ethyl nitrile	= Acetonitrile
Ethyl nitrite	= Ethyl nitrite
Ethyl orthosilicate	= Ethyl silicate
Ethyl parathion	= Parathion
Ethyl phosphate	= Triethyl phosphate
Ethyl phosphonothioic dichloride	= Ethyl phosphonothioic dichloride
Ethyl phosphorodichloridate	= Ethyl phosphorodichloridate
Ethyl phosphorodichloridothionate	= Ethyl phosphonothioic dichloride
Ethyl phthalate	= Diethyl phthalate
Ethyl propionate	= Ethyl propionate
Ethyl propionyl	= Diethyl ketone
Ethyl silicate 40	= Ethyl silicate
Ethyl silicate condensed	= Ethyl silicate
Ethyl silicate	= Ethyl silicate
Ethyl sulfate	= Diethyl sulfate
Ethyl sulfhydrate	= Ethyl mercaptan
Ethyl thionophosphoryl dichloride	= Ethyl phosphonothioic dichloride
2-Ethyl toluene	= 2-Ethyl toluene
Ethyl vinyl ether	= Vinyl ethyl ether
Ethylacetic acid	= n-Butyric acid
Ethylaluminum dichloride	= Ethylaluminum dichloride
Ethylaluminum sesquichloride	= Ethylaluminum sesquichloride
Ethylamine	= Ethylamine
Ethylbenzene	= Ethylbenzene
2-Ethylbutyl alcohol	= Ethyl butanol
Ethylbutylamine	= N-Ethyl-n-butylamine
2-Ethylcaproaldehyde	= Ethylhexaldehyde
alpha-Ethylcaproic acid	= 2-Ethylhexanoic acid
Ethylcarbinol	= n-Propyl alcohol
Ethylcyanide	= Propionitrile
N-Ethylcyclohexanamine	= N-Ethylcyclohexylamine
N-Ethylcyclohexylamine	= N-Ethylcyclohexylamine
Ethylchlorosilane	= Ethylchlorosilane
Ethylene acetate	= Ethylene glycol diacetate
Ethylene aldehyde	= Acrolein
Ethylene bis (iminodiacetic acid)	= Ethylenediamine tetracetic acid
Ethylene bromide	= Ethylene dibromide

SYNONYM	COMPOUND NAMES
Ethylene carboxylic acid	= Acrylic acid
Ethylene chlorhydrin	= Ethylene chlorohydrin
Ethylene chloride	= Ethylene dichloride
Ethylene chlorohydrin	= Ethylene chlorohydrin
Ethylene cyanohydrin	= Ethylene cyanohydrin
Ethylene diacetate	= Ethylene glycol diacetate
Ethylene dibromide	= Ethylene dibromide
Ethylene dichloride	= Ethylene dichloride
Ethylene dihydrate	= Ethylene glycol
Ethylene glycol acetate	= Ethylene glycol acetate
Ethylene glycol diacetate	= Ethylene glycol diacetate
Ethylene glycol dibutyl ether	= Ethylene glycol dibutyl ether
Ethylene glycol diethyl ether	= Ethylene glycol diethyl ether
Ethylene glycol dihydroxydiethyl ether	= Triethylene glycol
Ethylene glycol dimethyl ether	= Ethylene glycol dimethyl ether
Ethylene glycol ethyl ether	= 2-Ethoxyethanol
Ethylene glycol ethyl ether	= Ethylene glycol monoethyl ether
Ethylene glycol isopropyl ether	= Ethylene glycol isopropyl ether
Ethylene glycol methyl ether acetate	= Ethylene glycol methyl ether acetate
Ethylene glycol monobutyl ether acetate	= Ethylene glycol monobutyl ether acetate
Ethylene glycol monobutyl ether	= Ethylene glycol monobutyl ether
Ethylene glycol monoethyl ether acetate	= 2-Ethoxyethyl acetate
Ethylene glycol monoethyl ether acetate	= Ethylene glycol monoethyl ether acetate
Ethylene glycol monoethyl ether	= 2-Ethoxyethanol
Ethylene glycol monoethyl ether	= Ethylene glycol monoethyl ether
Ethylene glycol monomethyl ether acetate	= Ethylene glycol methyl ether acetate
Ethylene glycol monomethyl ether	= Ethylene glycol monomethyl ether
Ethylene glycol monopropyl ether	= Ethylene glycol propyl ether
Ethylene glycol phenyl ether	= Ethylene glycol phenyl ether
Ethylene glycol propyl ether	= Ethylene glycol propyl ether
Ethylene glycol, monoacetate	= Ethylene glycol acetate
Ethylene glycol	= Ethylene glycol
Ethylene oxide	= Ethylene oxide
Ethylene	= Ethylene
Ethylenebis [dithiocarbamic acid], disodium salt	= Nabam
Ethylenediamine tetracetic acid	= Ethylenediamine tetracetic acid
Ethylenediamine	= Ethylenediamine
Ethylenediamine	= Ethylenediamine
trans-1,2-Ethylenedicarboxylic acid	= Fumaric acid
cis-1,2-Ethylenedicarboxylic acid	= Maleic acid
(Ethylenedinitrilo) tetraacetic acid	= Ethylenediamine tetracetic acid
2,2'-Ethylenedioxydiethanol	= Triethylene glycol
Ethyleneimine	= Ethyleneimine
Ethylhexaldehyde	= Ethylhexaldehyde
2-Ethylhexanal	= Ethylhexaldehyde
2-Ethylhexanoic acid	= 2-Ethylhexanoic acid
2-Ethylhexoic acid	= 2-Ethylhexanoic acid
2-Ethylhexyl acetate	= 2-Ethylhexyl acetate
2-Ethylhexyl acrylate	= 2-Ethylhexyl acrylate
2-Ethylhexyl alcohol	= 2-Ethyl hexanol
Bis-(2-Ethylhexyl) hydrogen phosphate	= Di-(2-ethylhexyl)phosphoric acid
Bis(2-Ethylhexyl) phthalate	= Di-(2-ethylhexyl)phthalate

SYNONYM	COMPOUND NAMES
bis-(2-Ethylhexyl) phthalate	= Dioctyl phthalate
Bis-(2-Ethylhexyl) sodium sulfosuccinate	= Dioctyl sodium sulfosuccinate
Bis-(2-Ethylhexyl)phthalate	= Ethyl hexyl phthalate
2-Ethylhexyl, 2-propenoate	= 2-Ethylhexyl acrylate
2-Ethylhexylamine	= 2-Ethylhexylamine
beta-Ethylhexylamine	= 2-Ethylhexylamine
Ethylidene chloride	= 1,1-Dichloroethane
Ethylidene dichloride	= 1,1-Dichloroethane
Ethylidene diethylether	= Acetal
Ethylidene difluoride	= 1,1-Difluoroethane
Ethylidene fluoride	= 1,1-Difluoroethane
Ethylidene norbornene	= Ethylidene norbornene
5-Ethylidenebicyclo (2, 2, 1)hept-2-ene	= Ethylidene norbornene
Ethylidenenorbornylene	= Ethylidene norbornene
Ethylidenenorcamphene	= Ethylidene norbornene
o-Ethylmethylbenzene	= 2-Ethyl toluene
Ethylmethylketone peroxide	= 2-Butanone peroxide
n-Ethylmorpholine	= n-Ethyl morpholine
4-Ethylmorpholine	= n-Ethyl morpholine
2-Ethylphenol	= Ethylphenol
Ethylphenol	= Ethylphenol
o-Ethylphenol	= Ethylphenol
Ethylphenyldichlorosilane	= Ethylphenyldichlorosilane
Ethylpyrophosphate	= Tetraethyl pyrophosphate
Ethylsilicon trichloride	= Ethyltrichlorosilane
o-Ethyltoluene	= 2-Ethyl toluene
Ethyltrichlorosilane	= Ethyltrichlorosilane
Ethylzinc	= Diethylzinc
Ethyne	= Acetylene
Ethynyl carbinol	= Propargyl alcohol
Ethynyl methanol	= Propargyl alcohol
Eufin	= Diethyl carbonate
Eunatrol	= Oleic acid, sodium salt
Exitelite	= Antimony trioxide
F-11	= Trichlorofluoromethane
F-114	= Dichlorotetrafluoroethane
F-12	= Dichlorodifluoromethane
F-124	= Monochlorotetrafluoroethane
F-13	= Monochlorotrifluoromethane
F-21	= Dichloromonofluoromethane
Falkitol	= Hexachloroethane
Fasciolin	= Hexachloroethane
Fast red GG base	= 4-Nitroaniline
Fast red IG base	= 4-Nitroaniline
Fast red TR base	= 4-Chloro-o-toluidine
Fast white	= Lead sulfate
Fenoprop	= 2-(2,4,5-Trichlorophenoxy) propanoic acid
Fermentation alcohol	= Ethyl alcohol
Fermentation amyl alcohol	= Isoamyl alcohol
Fermentation butyl alcohol	= Isobutyl alcohol
Fermine	= Dimethyl phthalate
Ferric ammonium citrate, brown	= Ferric ammonium citrate
Ferric ammonium citrate, green	= Ferric ammonium citrate

SYNONYM	COMPOUND NAMES
Ferric ammonium citrate	= Ferric ammonium citrate
Ferric ammonium oxalate	= Ferric ammonium oxalate
Ferric chloride, anhydrous	= Ferric chloride
Ferric chloride, hexahydrate	= Ferric chloride
Ferric chloride	= Ferric chloride
Ferric fluoride	= Ferric fluoride
Ferric glycerophosphate	= Ferric glycerophosphate
Ferric nitrate nonahydrate	= Ferric nitrate
Ferric nitrate	= Ferric nitrate
Ferric sulfate	= Ferric sulfate
Ferrophosphorus	= Ferrophosphorus
Ferrosilicon	= Ferrosilicon
Ferrous ammonium sulfate hexahydrate	= Ferrous ammonium sulfate
Ferrous ammonium sulfate	= Ferrous ammonium sulfate
Ferrous borofluoride	= Ferrous fluoroborate
Ferrous chloride tetrahydrate	= Ferrous chloride
Ferrous chloride	= Ferrous chloride
Ferrous fluoroborate	= Ferrous fluoroborate
Ferrous oxalate dihydrate	= Ferrous oxalate
Ferrous oxalate	= Ferrous oxalate
Ferrous sulfate	= Ferrous sulfate
Ferrox	= Ferrous oxalate
Fertilizer acid	= Sulfuric acid
Filmerine	= Sodium nitrite
Flaxseed oil	= Oils, miscellaneous: linseed
Flexol plasticizer DIOP	= Diisooctyl phthalate
Flouristan	= Stannous flouride
Flowers of antimony	= Antimony trioxide
Fluophosgene	= Carbon oxyfluoride
Fluorane 114	= Dichlorotetrafluoroethane
Fluorine	= Fluorine
2-Fluoro-1-methylbenzene	= 2-Fluorotoluene
4-Fluoro-1-methylbenzene	= 4-Fluorotoluene
1-Fluoro-2-methylbenzene	= 2-Fluorotoluene
1-Fluoro-3-methylbenzene	= 3-Fluorotoluene
1-Fluoro-4-methylbenzene	= 4-Fluorotoluene
Fluoroacetic acid, sodium salt	= Sodium fluoroacetate
o-Fluoroaniline	= 2-Fluoroaniline
2-Fluoroaniline	= 2-Fluoroaniline
4-Fluoroaniline	= 4-Fluoroaniline
p-Fluoroaniline	= 4-Fluoroaniline
2-Fluorobenzenamine	= 2-Fluoroaniline
4-Fluorobenzenamine	= 4-Fluoroaniline
Fluorobenzene	= Fluorobenzene
Fluorodichloromethane	= Dichloromonofluoromethane
Fluoroethylene	= Vinyl fluoride
Fluoroformyl fluoride	= Carbon oxyfluoride
2-Fluorophenylamine	= 2-Fluoroaniline
4-Fluorophenylamine	= 4-Fluoroaniline
Fluorophosgene	= Carbon oxyfluoride
Fluorosilic acid	= Fluosilicic acid
Fluorosilic acid	= Hydrofluorosilicic acid (25% or less)
Fluorosulfonic acid	= Fluosulfonic acid
Fluorosulfuric acid	= Fluosulfonic acid

SYNONYM	COMPOUND NAMES
2-Fluorotoluene	= 2-Fluorotoluene
o-Fluorotoluene	= 2-Fluorotoluene
m-Fluorotoluene	= 3-Fluorotoluene
3-Fluorotoluene	= 3-Fluorotoluene
4-Fluorotoluene	= 4-Fluorotoluene
p-Fluorotoluene	= 4-Fluorotoluene
Fluorspar	= Calcium fluoride
Fluosilicic acid	= Fluosilicic acid
Fluospar	= Calcium fluoride
Fluosulfonic acid	= Fluosulfonic acid
Fluxing oil	= Asphalt blending stocks: roofers flux
Foliage oil	= Oils, miscellaneous: spray
Formaldehyde dimethylacetol	= Methyl formal
Formaldehyde polymer	= Paraformaldehyde
Formaldehyde solution	= Formaldehyde solution
Formalin	= Formaldehyde solution
Formalith	= Formaldehyde solution
Formamide	= Formamide
Formic acid, amide	= Formamide
Formic acid, ammonium salt	= Ammonium formate
Formic acid, ethyl ester	= Ethyl formate
Formic acid, methyl ester	= Methyl formate
Formic acid, zinc salt	= Zinc formate
Formic acid	= Formic acid
Formic aldehyde solution	= Formaldehyde solution
Formic ether	= Ethyl formate
Formyl tribromide	= Bromoform
Formylformic acid	= Glyoxylic acid (50% or less)
Formylic acid	= Formic acid
2-Formylphenol	= Salicylaldehyde
Fowlers solution	= Potassium arsenite
Freemans white lead	= Lead sulfate
French verdigris	= Copper subacetate
Freon-22	= Chlorodifluoromethane
Freon 11	= Trichlorofluoromethane
Freon 113	= 1,1,2-Trichloro-1,2,2-trifluoroethane
Freon 114	= Dichlorotetrafluoroethane
Freon 12	= Dichlorodifluoromethane
Freon 13	= Monochlorotrifluoromethane
Freon 21	= Dichloromonofluoromethane
Frigen 11	= Trichlorofluoromethane
Frigen 113TR	= 1,1,2-Trichloro-1,2,2-trifluoroethane
Frigen 12	= Dichlorodifluoromethane
Fuel oil 1-D	= Oils: diesel
Fuel oil 2-D	= Oils: diesel
Fuel oil no. 1	= Jet fuels: JP-1
Fuel oil no. 1	= Kerosene
Fuel oil no. 1	= Oils, miscellaneous: range
Fumaric acid	= Fumaric acid
Fumigrain	= Acrylonitrile
Fuming liquid arsenic	= Arsenic trichloride
Fuming sulfuric acid	= Oleum
Furadan	= Carbofuran
Fural/pyromucic aldehyde	= Furfural

SYNONYM	COMPOUND NAMES
Fural	= Furfural
2-Furaldehyde	= Furfural
Furan	= Furan
2-Furancarbinol	= Furfuryl alcohol
2,5-Furanedione	= Maleic anhydride
Furfural	= Furfural
Furfuralcohol	= Furfuryl alcohol
Furfuraldehyde	= Furfural
Furfuran	= Furan
Furfurole	= Furfural
Furfuryl alcohol	= Furfuryl alcohol
2-Furylcarbinol	= Furfuryl alcohol
Fusel oil	= Isoamyl alcohol
Fyde	= Formaldehyde solution
Galena	= Lead sulfide
Gallic acid monohydrate	= Gallic acid
Gallic acid	= Gallic acid
Gallotannic acid	= Tannic acid
Gallotannin	= Tannic acid
Gammexane	= gamma-Benzene hexachloride
Gas oil: cracked	= Gas oil: cracked
Gasoline blending stocks: alkylates	= Gasoline blending stocks: alkylates
Gasoline blending stocks: reformates	= Gasoline blending stocks: reformates
Gasolines: automotive (<4.23g lead/gal)	= Gasolines: automotive (<4.23g lead/gal)
Gasolines: aviation (< 4.86g lead/gal)	= Gasolines: aviation (< 4.86g lead/gal)
Gasolines: casinghead	= Gasolines: casinghead
Gasolines: polymer	= Gasolines: polymer
Gasolines: straight run	= Gasolines: straight run
GC-1189	= Kepone
Gelbin yellow ultramarine	= Calcium chromate
Gemalgene	= Trichloroethylene
Genetron-22	= Chlorodifluoromethane
Genetron 11	= Trichlorofluoromethane
Genetron 1113	= Trifluorochloroethylene
Genetron 12	= Dichlorodifluoromethane
Gerhardite	= Copper nitrate
Glacial acetic acid	= Acetic acid
D-Glucitol	= Sorbitol
Glucose solution	= Dextrose solution
Glutaraldehyde solution	= Glutaraldehyde solution
Glycerine	= Glycerine
Glycerite	= Tannic acid
Glycerol trichlorhydrin	= 1,2,3-Trichloropropane
Glycerol	= Glycerine
Glyceryl trichlorhydrin	= 1,2,3-Trichloropropane
Glycidyl alpha-methyl acrylate	= Glycidyl methacrylate
Glycidyl isopropyl ether	= Isopropyl glycidyl ether
Glycidyl methacrylate	= Glycidyl methacrylate
Glycine copper complex	= Copper glycinate
Glycocol-copper	= Copper glycinate
Glycol-monoacetin	= Ethylene glycol acetate
Glycol butyl ether	= Ethylene glycol monobutyl ether
Glycol chlorohydrin	= Ethylene chlorohydrin
Glycol cyanohydrin	= Ethylene cyanohydrin

SYNONYM	COMPOUND NAMES
Glycol diacetate	= Ethylene glycol diacetate
Glycol dibromide	= Ethylene dibromide
Glycol dichloride	= Ethylene dichloride
Glycol monoacetate	= Ethylene glycol acetate
Glycol monobutyl ether acetate	= Ethylene glycol monobutyl ether acetate
Glycol monoethyl ether acetate	= 2-Ethoxyethyl acetate
Glycol monoethyl ether acetate	= Ethylene glycol monoethyl ether acetate
Glycol monoethyl ether	= 2-Ethoxyethanol
Glycol monoethyl ether	= Ethylene glycol monoethyl ether
Glycol monomethyl ether acetate	= Ethylene glycol methyl ether acetate
Glycol monomethylether	= Ethylene glycol monomethyl ether
Glycol	= Ethylene glycol
Glyoxal	= Glyoxal
Glyoxylic acid (50% or less)	= Glyoxylic acid (50% or less)
Grain alcohol	= Ethyl alcohol
Grape sugar solution	= Dextrose solution
Gray arsenic	= Arsenic
Green nickel oxide	= Nickel hydroxide
Green oil	= Anthracene
Green verdigris	= Copper subacetate
Green vitriol	= Ferrous sulfate
Gum turpentine	= Turpentine
Gusathion insecticide	= Azinphos methyl
Guthion insecticide	= Azinphos methyl
Halocarbon 21	= Dichloromonofluoromethane
Halogenated waxes	= Polychlorinated biphenyl
Halon 112	= Dichloromonofluoromethane
Halon 122	= Dichlorodifluoromethane
Halon 241	= Monochlorotetrafluoroethane
Halon 242	= Dichlorotetrafluoroethane
Hartshorn	= Ammonium carbonate
Hatcol XPE	= 1-Phenyl-1-xylyl ethane
HCBD	= Hexachlorobutadiene
HEA	= 2-Hydroxyethyl acrylate
Hendecanoic acid	= Undecanoic acid
Hendecanoic alcohol	= Undecanol
1-Hendecanol	= Undecanol
Heod	= Dieltrin
Heptachlor	= Heptachlor
1,4,5,6,7,8,8a- Heptachlorodicyclopentadiene	= Heptachlor
1-Heptadecanecarboxylic acid	= Stearic acid
cis-8-Heptadecylenecarboxylic acid	= Oleic acid
Heptane	= Heptane
n-Heptane	= Heptane
1-Heptanecarboxylic acid	= Octanoic acid
Heptanoic acid	= Heptanoic acid
1-Heptanol	= Heptanol
Heptanol	= Heptanol
3-Heptanone	= Ethyl butyl ketone
2-Heptanone	= Methylamyl ketone
2-Heptanone	= n-Amyl methyl ketone
Heptanyl acetate	= Heptyl acetate
1-Heptene	= 1-Heptene



SYNONYM	COMPOUND NAMES
Hepthlic acid	= Heptanoic acid
n-Heptoic acid	= Heptanoic acid
Heptyl acetate	= Heptyl acetate
n-Heptyl acetate	= Heptyl acetate
1-Heptyl acetate	= Heptyl acetate
Heptyl alcohol	= Heptanol
Heptylcarbinol	= Octanol
Heptylene	= 1-Heptene
n-Heptylethylene	= 1-Nonene
n-Heptylic acid	= Heptanoic acid
Hexa	= Hexamethylenetetramine
Hexachloro-1,3-butadiene	= Hexachlorobutadiene
1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4-endo-exo-5,8-dimethanonaphthalene.	= Aldrin
endo,exo-1,2,3,4,10,10-Hexachloro-6,7-expoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4:5,8-dimethanonaphthalene	= Dieldrin
Hexachlorobenzene	= Hexachlorobenzene
Hexachlorobutadiene	= Hexachlorobutadiene
1,2,3,4,5,6-Hexachlorocyclohexane	= gamma-Benzene hexachloride
Hexachlorocyclopentadiene dimer	= Mirex
Hexachlorocyclopentadiene	= Hexachlorocyclopentadiene
Hexachloroethane	= Hexachloroethane
Hexachlorophene	= Hexachlorophene
Hexacid 1095	= Decanoic acid
Hexacid 698	= Hexanoic acid
Hexacid 898	= Octanoic acid
Hexadecyl sulfate, sodium salt	= Hexadecyl sulfate, sodium salt
Hexadecyltrimethylammonium chloride	= Hexadecyltrimethylammonium chloride
Hexadrin	= Endrin
Hexafluosilicic acid	= Fluosilicic acid
Hexahydric alcohol	= Sorbitol
Hexahydro-1,4-diazine	= Piperazine
Hexahydro-2h-azepine-2-one	= Caprolactam
Hexahydroaniline	= Cyclohexylamine
Hexahydroazepine	= Hexamethylenimine
Hexahydrobenzene	= Cyclohexane
Hexahydrocresols	= 2-Methylcyclohexanol
Hexahydrocumene	= Isopropyl cyclohexane
Hexahydrophenol	= Cyclohexanol
Hexahydropyrazine	= Piperazine
Hexahydrotoluene	= Methylcyclohexane
n-Hexaldehyde	= n-Hexaldehyde
Hexalin	= Cyclohexanol
Hexamethylene	= Cyclohexane
Hexamethylenediamine	= Hexamethylenediamine
Hexamethylenetetramine	= Hexamethylenetetramine
Hexamethylenimine	= Hexamethylenimine
Hexamine	= Hexamethylenetetramine
Hexanal	= n-Hexaldehyde
Hexanaphthene	= Cyclohexane
Hexane carboxylic acid	= Heptanoic acid

SYNONYM	COMPOUND NAMES
Hexane, 1,6-diisocyanato- 2,2,4(2,4,4)-trimethyl-	= Trimethylhexamethylene diisocyanate
Hexane	= n-Hexane
n-Hexane	= n-Hexane
1,6-Hexanediamine, 2,2,4(or2,4,4)-trimethyl-	= Trimethyl hexamethylene diamine
1,6-Hexanediamine	= Hexamethylenediamine
Hexanedinitrile	= Adiponitrile
Hexanedioic acid, dimethyl ester	= Dimethyl adipate
Hexanedioic acid	= Adipic acid
1,2,3,4,5,6-Hexannehexol	= Sorbitol
Hexanoic acid, 2-ethyl-	= 2-Ethylhexanoic acid
Hexanoic acid	= Hexanoic acid
n-Hexanol	= 1-Hexanol
1-Hexanol	= 1-Hexanol
2-Hexanone	= Methyl n-butyl ketone
Hexaplas M/1B	= Diisobutyl phthalate
Hexaplas M/O	= Diisooctyl phthalate
alpha-Hexene	= 1-Hexene
1-Hexene	= 1-Hexene
iso-Hexene	= 2-Methyl-1-pentene
n-Hexoic acid	= Hexanoic acid
Hexone	= Methyl isobutyl ketone
n-Hexyl acetate	= Hexyl acetate
Hexyl acetate	= Hexyl acetate
1-Hexyl acetate	= Hexyl acetate
Hexyl acetate	= Methyl amyl acetate
Hexyl alcohol, acetate	= Hexyl acetate
n-Hexyl alcohol	= 1-Hexanol
sec-Hexyl alcohol	= Ethyl butanol
Hexyl carbitol	= Diethylene glycol n-hexyl ether
Hexyl ethanoate	= Hexyl acetate
Hexylene glycol	= Hexylene glycol
Hexylene	= 1-Hexene
HFSA	= Hydrofluorosilicic acid (25% or less)
HHDN	= Aldrin
Hi-dry	= Tetraethylene glycol
High speed bearing oil	= Oils, miscellaneous: spindle
Higher fatty alcohol	= Tallow fatty alcohol
HMDA	= Hexamethylenediamine
Home-heating oil	= Oils, fuel: 2
Homopiperidine	= Hexamethylenimine
Household ammonia	= Ammonium hydroxide (<28% aqueous ammonia)
HSDB 5700	= 2-Hydroxy-4-(methylthio)-butanoic acid
HTH dry chlorine	= Calcium hypochlorite
HTH	= Calcium hypochlorite
Hydracrylic acid, beta-lactone	= beta-Propiolactone
Hydracrylonitrile	= Ethylene cyanohydrin
Hydrazine-benzene	= Phenylhydrazine
Hydrazine	= Hydrazine
Hydrazinobenzene	= Phenylhydrazine
Hydrazoic acid, sodium salt	= Sodium azide
Hydrobromic acid monoammoniate	= Ammonium bromide

SYNONYM	COMPOUND NAMES
Hydrobromic acid, anhydrous	= Hydrogen bromide
Hydrochloric acid, anhydrous	= Hydrogen chloride
Hydrochloric acid	= Hydrochloric acid
Hydrocyanic acid, sodium salt	= Sodium cyanide
Hydrocyanic acid	= Hydrogen cyanide
Hydrocyanic ether	= Propionitrile
Hydrofluoric acid, anhydrous	= Hydrogen fluoride
Hydrofluoric acid	= Hydrofluoric acid
Hydrofluorosilicic acid (25% or less)	= Hydrofluorosilicic acid (25% or less)
Hydrofluosilic acid	= Fluosilicic acid
Hydrofol acid 1255 or 1295	= Lauric acid
Hydrogen bromide, anhydrous	= Hydrogen bromide
Hydrogen bromide	= Hydrogen bromide
Hydrogen chloride	= Hydrogen chloride
Hydrogen cyanide	= Hydrogen cyanide
Hydrogen fluoride	= Hydrogen fluoride
Hydrogen hexafluorosilicate	= Fluosilicic acid
Hydrogen peroxide carbamide	= Urea peroxide
Hydrogen peroxide	= Hydrogen peroxide
Hydrogen sulfide	= Hydrogen sulfide
Hydrogen	= Hydrogen
para-Hydrogen	= Hydrogen
1-Hydroperoxycyclohexyl	= Cyclohexanone peroxide
Hydroquinol	= Hydroquinone
Hydroquinone	= Hydroquinone
N-Hydroxyethyl-1,2-ethanediamine	= Aminoethylethanolamine
2-Hydroxy-1,2,3-propane-tricarboxylic acid	= Citric acid
1-Hydroxy-2-cyanoethane	= Ethylene cyanohydrin
2-Hydroxy-2-methyl-3-butyne	= Methyl butynol
2-Hydroxy-2-methylpropanenitrile	= Acetone cyanohydrin
1-Hydroxy-2-phenoxyethane	= Ethylene glycol phenyl ether
1-Hydroxy-2,4-dinitro-benzene	= 2,4-Dinitrophenol
6-Hydroxy-3-(2h)-pyridazinone	= Maleic hydrazide
2-Hydroxy-4-(methylthio)-butanoic acid	= 2-Hydroxy-4-(methylthio)-butanoic acid
4-Hydroxy-4-methyl-2-pentanone	= Diacetone alcohol
2-Hydroxy-m-xylene	= Xylenol
beta-Hydroxy-tricarboxylic acid	= Citric acid
Alpha-Hydroxy isobutronitrile	= Acetone cyanohydrin
O-Hydroxybenzaldehyde	= Salicylaldehyde
Hydroxybenzene	= Phenol
o-Hydroxybenzoic acid	= Salicylic acid
1-Hydroxybutane	= n-Butyl alcohol
2-Hydroxybutane	= sec-Butyl alcohol
2-Hydroxychlorobenzene	= o-Chlorophenol
Hydroxycyclohexane	= Cyclohexanol
1-Hydroxycyclohexyl peroxide	= Cyclohexanone peroxide
Hydroxydimethylarsine oxide	= Cacodylic acid
Bis-[2-(2-Hydroxyethoxy) ethyl ether	= Tetraethylene glycol
2-Hydroxyethyl 2-propenoate	= 2-Hydroxyethyl acrylate
2-Hydroxyethyl acetate	= Ethylene glycol acetate
2-Hydroxyethyl acrylate	= 2-Hydroxyethyl acrylate
beta-Hydroxyethyl acrylate	= 2-Hydroxyethyl acrylate
b-Hydroxyethyl isopropyl ether	= Ethylene glycol isopropyl ether

SYNONYM	COMPOUND NAMES
Bis-(2-Hydroxyethyl) amine	= Diethanolamine
Bis-(2-Hydroxyethyl) ether	= Diethylene glycol
Tris(Hydroxyethyl)amine	= Triethanolamine
2-Hydroxyethylamine	= Monoethanolamine
N-Beta-Hydroxyethylethylenediamine	= Aminoethylethanolamine
1-Hydroxyheptane	= Heptanol
1-Hydroxyhexane	= 1-Hexanol
Hydroxylamine sulfate	= Hydroxylamine sulfate
Hydroxylamine	= Hydroxylamine
2,2-bis(Hydroxymethyl)-1,3-propanediol	= Pentaerythritol
2-Hydroxymethylfuran	= Furfuryl alcohol
2-Hydroxynitrobenzene	= 2-Nitrophenol
3-Hydroxynitrobenzene	= 3-Nitrophenol
m-Hydroxynitrobenzene	= 3-Nitrophenol
4-Hydroxynitrobenzene	= 4-Nitrophenol
2,2-Bis(4-Hydroxyphenyl)propane	= Bisphenol A
3-Hydroxypropanenitrile	= Ethylene cyanohydrin
2-Hydroxypropanoic acid	= Lactic acid
alpha-Hydroxypropionic acid	= Lactic acid
2-Hydroxypropionitrile	= Lactonitrile solution (80% or less)
Hydroxypropyl acrylate	= Hydroxypropyl acrylate
Hydroxypropyl methacrylate	= Hydroxypropyl methacrylate
Tris(2-Hydroxypropyl) amine	= Triisopropanolamine
2-Hydroxypropylamine	= Monoisopropanolamine
Alpha-Hydroxytoluene	= Benzyl alcohol
3-Hydroxytoluene	= m-Cresol
o-Hydroxytoluene	= o-Cresol
4-Hydroxytoluene	= p-Cresol
Hydroxytoluenes	= Cresols
beta-Hydroxytricarballic acid	= Citric acid
2-Hydroxytriethylamine	= N,N-Diethylethanolamine
Hylene M50	= Diphenylmethane diisocyanate
Hylene T	= Toluene 2,4-diisocyanate
Hystrene 9512	= Lauric acid
Hytrol O	= Cyclohexanone
IBN	= Isobutyronitrile
Illuminating oil	= Kerosene
1,1'-Iminodi-2-propanol	= Diisopropanolamine
2,2'-Iminodiethanol	= Diethanolamine
Imperial green	= Copper acetoarsenite
Inedible tallow	= Tallow
Insulating oil	= Oils, miscellaneous: transformer
Iodomethane	= Methyl iodide
IPDI	= Isophorone diisocyanate
Iron (ous) sulfate	= Ferrous sulfate
Iron ammonium sulfate	= Ferrous ammonium sulfate
Iron dichloride	= Ferrous chloride
Iron fluoride	= Ferric fluoride
Iron III chloride	= Ferric chloride
Iron perchloride	= Ferric chloride
Iron protochloride	= Ferrous chloride
Iron protoxalate	= Ferrous oxalate
Iron sesquisulfate	= Ferric sulfate
Iron tersulfate	= Ferric sulfate

SYNONYM	COMPOUND NAMES
Iron trichloride	= Ferric chloride
Iron vitriol	= Ferrous sulfate
Iron(III) sulfate	= Ferric sulfate
Isceon 11	= Trichlorofluoromethane
Isoamyl alcohol	= Isoamyl alcohol
Isoamyl ethanoate	= Isoamylacetate
Isoamylacetate	= Isoamylacetate
Isobutane	= Isobutane
Isobutanol-2-amine	= 2-Amino-2-methyl-1-propanol (90% or less)
Isobutanol amine	= 2-Amino-2-methyl-1-propanol (90% or less)
Isobutanol	= Isobutyl alcohol
Isobutene trimer	= Triisobutylene
Isobutene	= Isobutylene
Isobutyl 2-methyl-2-propenoate	= Isobutyl methacrylate
Isobutyl 2-propenoate	= iso-butyl acrylate
Isobutyl acetate	= Isobutyl acetate
Isobutyl alcohol	= Isobutyl alcohol
Isobutyl alpha-methacrylate	= Isobutyl methacrylate
Isobutyl isobutyrate	= Isobutyl isobutyrate
Isobutyl methacrylate	= Isobutyl methacrylate
Isobutyl methyl ketone	= Methyl isobutyl ketone
Isobutyl methylmethanol	= Methyl amyl alcohol
Isobutyl phthalate	= Diisobutyl phthalate
Isobutylaldehyde	= iso-butyraldehyde
Isobutylamine	= Isobutylamine
Isobutylcarbinol	= Isoamyl alcohol
Isobutylene	= Isobutylene
Isobutylmethylcarbinol	= Methyl amyl alcohol
Isobutylmethylcarbinol	= Methyl isobutyl carbinol
Isobutyraldehyde	= iso-butyraldehyde
1-Isobutyrate	= 1-Isobutyrate
Isobutyric acid	= Isobutyric acid
Isobutyric aldehyde	= iso-butyraldehyde
Isobutyronitrile	= Isobutyronitrile
Isocetyl trichlorophenoxyacetate	= 2,4,5-T esters
Isocumene	= n-Propylbenzene
Isocyanatomethane	= Methyl isocyanate
Isocyanic acid, methyl ester	= Methyl isocyanate
Isodecaldehyde, mixed isomers	= Isodecaldehyde
Isodecaldehyde	= Isodecaldehyde
Isodecyl acrylate	= Isodecyl acrylate
Isodecyl alcohol	= Isodecyl alcohol
Isodiprene	= Carene
Isodurene	= 1,2,3,5-Tetramethylbenzene
Isohexane	= Isohexane
Isonitropropane	= 2-Nitropropane
Isooctaldehyde	= Isooctaldehyde
Isooctyl alcohol	= Isooctyl alcohol
Isooctyl ester	= Isooctyl ester
Isooctylaldehyde	= Isooctaldehyde
Isopentane	= Isopentane
Isopentyl acetate	= Isoamylacetate

SYNONYM	COMPOUND NAMES
Isopentyl alcohol	= Isoamyl alcohol
Isopentyl nitrite	= iso-Amyl nitrite
Isophorone diamine diisocyanate	= Isophorone diisocyanate
Isophorone diamine	= Isophorone diamine
Isophorone diisocyanate	= Isophorone diisocyanate
Isophorone	= Isophorone
Isophthalic acid	= Isophthalic acid
Isoprene	= Isoprene
Isopropanol	= Isopropyl alcohol
Isopropanolamine	= Monoisopropanolamine
Isopropene cyanide	= Methacrylonitrile
Isopropenyl methyl ketone	= Methyl isopropenyl ketone
Isopropenylbenzene	= alpha-Methylstyrene
Isopropenyl nitrile	= Methacrylonitrile
2-Isopropoxy propane	= Isopropyl ether
2-Isopropoxyethanol	= Ethylene glycol isopropyl ether
Isopropyl 2, 4-dichlorophenoxy acetate	= 2,4-D esters
Isopropyl acetate	= Isopropyl acetate
Isopropyl alcohol	= Isopropyl alcohol
Isopropyl cellosolve	= Ethylene glycol isopropyl ether
Isopropyl cyanide	= Isobutyronitrile
Isopropyl cyclohexane	= Isopropyl cyclohexane
Isopropyl epoxypropyl ether	= Isopropyl glycidyl ether
Isopropyl ether	= Isopropyl ether
Isopropyl glycidyl ether	= Isopropyl glycidyl ether
Isopropyl glycol	= Ethylene glycol isopropyl ether
Isopropyl mercaptan	= Isopropyl mercaptan
Isopropyl methyl ketone	= 3-Methyl-2-butanone
Isopropyl percarbonate	= Isopropyl percarbonate
Isopropyl peroxydicarbonate	= Isopropyl percarbonate
o-Isopropyl phenol	= o-Isopropyl phenol
2-Isopropyl phenol	= o-Isopropyl phenol
Isopropylacetone	= Methyl isobutyl ketone
Isopropylamine	= Dodecylbenzenesulfonic acid, isopropylamine salt
dodecylbenzenesulfonate	
Isopropylamine	= Isopropylamine
Isopropylamino-s-triazine	= Atrazine
Isopropylbenzene hydroperoxide	= Cumene hydroperoxide
Isopropylbenzene	= Cumene
Isopropylcarbinol	= Isobutyl alcohol
Isopropylcumyl hydroperoxide	= Diisopropylbenzene hydroperoxide
Isopropylformic acid	= Isobutyric acid
4,4'-Isopropylidenediphenol	= Bisphenol A
Isopropylideneacetone	= Mesityl oxide
4,4'-Isopropylidenediphenol-	= Bisphenol A diglycidyl ether
p-Isopropyltoluene	= p-Cymene
Isopropyltoluol	= p-Cymene
Isothiocyanatomethane	= Methyl isothiocyanate
Isothiocyanic acid, methyl ester	= Methyl isothiocyanate
Isothiourea	= Thiocarbamide
Isotridecanol	= Tridecanol
Isotridecyl alcohol	= Tridecanol
Isotron-22	= Chlorodifluoromethane
Isotron 11	= Trichlorofluoromethane

SYNONYM	COMPOUND NAMES
Isotron 12	= Dichlorodifluoromethane
Isovaleral	= Isovaleraldehyde
Isovaleraldehyde	= Isovaleraldehyde
Isovaleric aldehyde	= Isovaleraldehyde
Isovalerone	= Diisobutyl ketone
Javelle water	= Sodium hypochlorite solution
Jayflex DTDp	= Ditridecyl phthalate
Jet fuel: JP-1	= Kerosene
Jet fuels: JP-1	= Jet fuels: JP-1
Jet fuels: JP-3	= Jet fuels: JP-3
Jet fuels: JP-4	= Jet fuels: JP-4
Jet fuels: JP-5	= Jet fuels: JP-5
JP-1	= Oils, fuel: no. 1
JP-1	= Oils, miscellaneous: range
K-flex DP	= Dipropylene glycol dibenzoate
Karmex	= Diuron
Kel F monomer	= Trifluorochloroethylene
Kelthane	= 4,4'-Dichloro-alpha-trichloromethyl benzhydrol
Kelthanethanol	= 4,4'-Dichloro-alpha-trichloromethyl benzhydrol
Kepone	= Kepone
Kerosene, heavy	= Jet fuels: JP-5
Kerosene, heavy	= Oils, miscellaneous: spray
Kerosene	= Jet fuels: JP-1
Kerosene	= Kerosene
Kerosene	= Oils, fuel: no. 1
Kerosene	= Oils, miscellaneous: range
Kerosine	= Jet fuels: JP-1
Kerosine	= Kerosene
Kerosine	= Oils, fuel: no. 1
Kerosine	= Oils, miscellaneous: range
2-Ketoheptane	= n-Amyl methyl ketone
2-Ketohexamethylenimine	= Caprolactam
Ketone, heptyl methyl	= Methyl heptyl ketone
Ketonox	= 2-Butanone peroxide
Kettle rendered lard	= Oils, edible: lard
Killax	= Tetraethyl pyrophosphate
Killmaster	= Dursban
King's gold	= Arsenic trisulfide
King's green	= Copper acetoarsenite
King's yellow	= Arsenic trisulfide
Korax	= 1-Chloro-1-nitropropane
Kurosalg	= 2-(2,4,5-Trichlorophenoxy) propanoic acid
Kwik-kil	= Strychnine
DL-Lactic acid, ammonium salt	= Ammonium lactate
Lactic acid, ethyl ester	= Ethyl lactate
Lactic acid	= Lactic acid
Lactonitrile solution (80% or less)	= Lactonitrile solution (80% or less)
LAH	= Lithium aluminum hydride
Lanarkite	= Lead sulfate
Lard	= Oils, edible: lard
Latex, liquid synthetic	= Latex, liquid synthetic

SYNONYM	COMPOUND NAMES
Laughing gas	= Nitrous oxide
Lauric acid	= Lauric acid
Laurostearic acid	= Lauric acid
Lauroyl peroxide	= Lauroyl peroxide
Lauryl alcohol	= Dodecanol
Lauryl ammonium sulfate	= Ammonium lauryl sulfate
Lauryl magnesium sulfate	= Dodecyl sulfate, magnesium salt
Lauryl mercaptan	= Lauryl mercaptan
Lauryl methacrylate	= Dodecylmethacrylate
Lauryl sodium sulfate	= Dodecyl sulfate, sodium salt
Lauryl sulfate, diethanolamine salt solution	= Dodecyl sulfate, diethanolamine salt
Lauryl sulfate, magnesium salt	= Dodecyl sulfate, magnesium salt
Lauryl sulfate, sodium salt	= Dodecyl sulfate, sodium salt
Lauryl sulfate, triethanolamine salt	= Dodecyl sulfate, triethanolamine salt
Laurylbenzene	= Dodecylbenzene
Laurylbenzenesulfonic acid	= Dodecylbenzenesulfonic acid
Lead (II) chloride	= Lead chloride
Lead acetate trihydrate	= Lead acetate
Lead acetate	= Lead acetate
Lead alkyls	= Lead alkyls
Lead arsenate, acid	= Lead arsenate
Lead arsenate	= Lead arsenate
Lead bottoms	= Lead sulfate
Lead chloride	= Lead chloride
Lead dichloride	= Lead chloride
Lead difluoride	= Lead fluoride
Lead fluoborate	= Lead fluoroborate
Lead fluoride	= Lead fluoride
Lead fluoroborate solution	= Lead fluoroborate
Lead fluoroborate	= Lead fluoroborate
Lead hyposulfite	= Lead thiosulfate
Lead iodide	= Lead iodide
Lead IV acetate	= Lead tetraacetate
Lead monoxide	= Litharge
Lead nitrate	= Lead nitrate
Lead oxide yellow	= Litharge
Lead protoxide	= Litharge
Lead stearate	= Lead stearate
Lead sulfate	= Lead sulfate
Lead sulfide	= Lead sulfide
Lead sulfocyanate	= Lead thiocyanate
Lead tetraacetate	= Lead tetraacetate
Lead tetraethyl	= Tetraethyl lead
Lead tetramethyl	= Tetramethyl lead
Lead thiocyanate	= Lead thiocyanate
Lead thiosulfate	= Lead thiosulfate
Lead tungstate	= Lead tungstate
Lead wolframate	= Lead tungstate
Leaf lard	= Oils, edible: lard
Lemonene	= Diphenyl
Leucol	= Quinoline
Levepox hardener T3	= Pentaethylenehexamine
Lichenic acid	= Fumaric acid



SYNONYM	COMPOUND NAMES
Light naphtha	= Naphtha: solvent
Light naphtha	= Naphtha: VM & P
Light oil	= Oils, miscellaneous: coal tar
Limed wood rosin	= Calcium resinate
Limonene	= Dipentene
Lindane	= gamma-Benzene hexachloride
Linear alcohols	= Linear alcohols
Linseed oil	= Oils, miscellaneous: linseed
Liquamon 28	= Urea, ammonium nitrate soln (w/aqua ammonia)
Liquefied natural gas	= Liquefied natural gas
Liquefied petroleum gas	= Liquefied petroleum gas
Liquefied phenol	= Carbolic oil (mixture)
Liquid ammonia	= Ammonia, anhydrous
Liquid asphalt	= Asphalt blending stocks: roofers flux
Liquid asphalt	= Oils, miscellaneous: road
Liquid bleach	= Sodium hypochlorite
Liquid camphor	= Camphor oil
Liquid gum camphor	= Camphor oil
Liquid hydrogen	= Hydrogen
Liquid impure camphor	= Camphor oil
Liquid nitrogen	= Nitrogen
Liquid oxygen	= Oxygen
Liquid petrolatum	= Oils, miscellaneous: mineral
Litharge	= Litharge
Lithium aluminum hydride	= Lithium aluminum hydride
Lithium bichromate dihydrate	= Lithium bichromate
Lithium bichromate	= Lithium bichromate
Lithium chromate	= Lithium chromate
Lithium dichromate	= Lithium bichromate
Lithium hydride	= Lithium hydride
Lithium	= Lithium
LNG	= Liquefied natural gas
Long-time burning oil	= Oils, miscellaneous: mineral seal
Lorol-22	= n-Decyl alcohol
Lorsban	= Dursban
LOX	= Oxygen
LPG	= Liquefied petroleum gas
Lubricating oil	= Oils, miscellaneous: motor
Lucidol	= Dibenzoyl peroxide
Lumbrical	= Piperazine
Lunar caustic	= Silver nitrate
Luperco JDB-50-T	= Cyclohexanone peroxide
Lye	= Caustic potash solution
Lye	= Caustic soda solution
Lye	= Potassium hydroxide
Lye	= Sodium hydroxide
M-B-C fumigant	= Methyl bromide
MAA	= Methyl isobutyl carbinol
MAAC	= Methyl amyl acetate
Macquer's salt	= Potassium arsenate
Magnesium dodecyl sulfate	= Dodecyl sulfate, magnesium salt
Magnesium lauryl sulfate	= Dodecyl sulfate, magnesium salt
Magnesium nitrate hexahydrate	= Magnesium nitrate

SYNONYM	COMPOUND NAMES
Magnesium nitrate	= Magnesium nitrate
Magnesium perchlorate hexahydrate	= Magnesium perchlorate
Magnesium perchlorate, anhydrous	= Magnesium perchlorate
Magnesium perchlorate	= Magnesium perchlorate
Magnesium	= Magnesium
Malathion	= Malathion
Malazide	= Maleic hydrazide
Maleic acid hydrazide	= Maleic hydrazide
Maleic acid	= Maleic acid
Maleic anhydride	= Maleic anhydride
Maleic hydrazide	= Maleic hydrazide
Maleinic acid	= Maleic acid
Malenic acid	= Maleic acid
Malix	= Endosulfan
Malonic dinitrile	= Propanedinitrile
Malonic mononitrile	= Cyanoacetic acid
Malononitrile	= Propanedinitrile
MAOH	= Methyl amyl alcohol
MAOH	= Methyl isobutyl carbinol
MAPP gas	= Methyl acetylene, propadiene mixture
Marlate 50	= Methoxychlor
Marmer	= Diuron
Marsh gas	= Methane
Marshite	= Copper iodide
Massicot	= Litharge
MCB	= Chlorobenzene
MCP	= Calcium phosphate
MDEA	= Methyl diethanolamine
MDI	= Diphenylmethane diisocyanate
Meadow green	= Copper acetoarsenite
Mediben	= Dicamba
MEK	= Methyl ethyl ketone
MEKP	= 2-Butanone peroxide
Mendrin	= Endrin
Menite	= Phosdrin
p-Mentha-1,8-diene	= Dipentene
MEP	= Methylethylpyridine
Mercaptobenzene	= Benzenethiol
Mercaptodimethur	= Mercaptodimethur
Mercaptoethane	= Ethyl mercaptan
Mercaptomethane	= Methyl mercaptan
Mercurialin	= Methylamine
Mercurialin	= Methylamine solution
Mercuric acetate	= Mercuric acetate
Mercuric ammonium chloride	= Mercuric ammonium chloride
Mercuric chloride, ammoniated	= Mercuric ammonium chloride
Mercuric chloride	= Mercuric chloride
Mercuric cyanide	= Mercuric cyanide
Mercuric iodide, red	= Mercuric iodide
Mercuric iodide	= Mercuric iodide
Mercuric nitrate	= Mercuric nitrate
Mercuric oxide, red	= Mercuric oxide
Mercuric oxide, yellow	= Mercuric oxide
Mercuric oxide	= Mercuric oxide

SYNONYM	COMPOUND NAMES
Mercuric sulfate	= Mercuric sulfate
Mercuric sulfide, black	= Mercuric sulfide
Mercuric sulfide, red	= Mercuric sulfide
Mercuric sulfide	= Mercuric sulfide
Mercuric sulfocyanate	= Mercuric thiocyanate
Mercuric sulfocyanide	= Mercuric thiocyanate
Mercuric thiocyanate	= Mercuric thiocyanate
Mercurous chloride	= Mercurous chloride
Mercurous nitrate monohydrate	= Mercurous nitrate
Mercurous nitrate	= Mercurous nitrate
Mercury (II) chloride	= Mercuric chloride
Mercury (II) cyanide	= Mercuric cyanide
Mercury (II) nitrate	= Mercuric nitrate
Mercury (II) sulfate (1:1)	= Mercuric sulfate
Mercury amide chloride	= Mercuric ammonium chloride
Mercury ammonium chloride	= Mercuric ammonium chloride
Mercury bichloride	= Mercuric chloride
Mercury biniodide	= Mercuric iodide
Mercury bisulfate	= Mercuric sulfate
Mercury cyanide	= Mercuric cyanide
Mercury monochloride	= Mercurous chloride
Mercury nitrate monohydrate	= Mercuric nitrate
Mercury oxide	= Mercuric oxide
Mercury perchloride	= Mercuric chloride
Mercury pernitrate	= Mercuric nitrate
Mercury persulfate	= Mercuric sulfate
Mercury protochloride	= Mercurous chloride
Mercury protonitrate	= Mercurous nitrate
Mercury rhodanide	= Mercuric thiocyanate
Mercury subchloride	= Mercurous chloride
Mercury	= Mercury
Merex	= Kepone
Mesityl oxide	= Mesityl oxide
Mesuirol	= Mercaptodimethur
Metacetone	= Diethyl ketone
Metallic resinate	= Calcium resinate
Metelilachlor	= Metolachlor
Metelilachlor	= Metolachlor
Methacetone	= Diethyl ketone
Methacrylate monomer	= Methyl methacrylate
Methacrylic acid, 2, 3-epoxypropyl ester	= Glycidyl methacrylate
Methacrylic acid, butyl ester	= n-Butyl methacrylate
Methacrylic acid, butyl, decyl, cetyl and eicosyl ester mix	= Butyl, decyl, cetyl-eicosyl methacrylate
Methacrylic acid, dodecyl and pentadecyl ester mix	= Dodecyl/pentadecyl methacrylate
Methacrylic acid, dodecyl ester	= Dodecylmethacrylate
Methacrylic acid, ethyl ester	= Ethyl methacrylate
Methacrylic acid, isobutyl ester	= Isobutyl methacrylate
Methacrylic acid, lauryl and pentadecyl ester mix	= Dodecyl/pentadecyl methacrylate
Methacrylic acid, methyl ester	= Methyl methacrylate
Methacrylic acid	= Methacrylic acid
Methacrylonitrile	= Methacrylonitrile

SYNONYM	COMPOUND NAMES
beta-Methallyl chloride	= Methallyl chloride
Methallyl chloride	= Methallyl chloride
Methanal solution	= Formaldehyde solution
Methanamide	= Formamide
Methane, isocyanato-	= Methyl isocyanate
Methane, tribromo-	= Bromoform
Methane	= Methane
Methanearsonic acid, sodium salt	= Methanearsonic acid, sodium salt
Methaneethiol	= Methyl mercaptan
Methanethiomethane	= Dimethyl sulfide
Methanoic acid, amide	= Formamide
Methanoic acid	= Formic acid
4,7-Methanoindene, 3a,4,7,7a-tetrahydrodimethyl	= Methylcyclopentadiene dimer
Methanol	= Methyl alcohol
Metheneamine	= Hexamethylenetetramine
Methenyl tribromide	= Bromoform
Methiocarb	= Mercaptodimethur
Methionine hydroxy analog	= 2-Hydroxy-4-(methylthio)-butanoic acid
Methmercapturon	= Mercaptodimethur
2-Methoxy-2-methyl propane	= Methyl tert-butyl ether
1-Methoxy-2-propanol acetate	= Propylene glycol methyl ether acetate
1-Methoxy-2-propanol	= Propylene glycol methyl ether
Methoxy DDT	= Methoxychlor
o-Methoxybenzoic acid	= Methyl salicylate
3-Methoxybutyl acetate	= 3-Methoxybutyl acetate
Methoxychlor	= Methoxychlor
2-Methoxyethanol	= Ethylene glycol monomethyl ether
2-(2-Methoxyethoxy)-ethanol	= Diethylene glycol monomethyl ether
2-Methoxyethyl acetate	= Ethylene glycol methyl ether acetate
Bis-(2-Methoxyethyl)-ether	= Diethylene glycol dimethyl ether
Methoxyethylene	= Vinyl methyl ether
2,2-bis-(p-Methoxyphenyl)-1,1,1-trichloroethane	= Methoxychlor
3-Methyl-1-butanol	= Isoamyl alcohol
3-Methyl-1-buten-3-ol	= Methyl butenol
2-Methyl-1-buten-3-one	= Methyl isopropenyl ketone
6-Methyl-1-heptanal	= Isooctaldehyde
6-Methyl-1-heptanol	= Isooctyl alcohol
2-Methyl-1-pentene	= 2-Methyl-1-pentene
4-Methyl-1-pentene	= 4-Methyl-1-pentene
1-Methyl-1-phenylethylene	= alpha-Methylstyrene
2-Methyl-1-propanol	= Isobutyl alcohol
2-Methyl-1-propyl acetate	= Isobutyl acetate
1-Methyl-1 propylethylene	= 2-Methyl-1-pentene
2-Methyl-1, 3-butadiene	= Isoprene
Methyl-1,3-butylene glycol acetate	= 3-Methoxybutyl acetate
1-Methyl-2-(3-pyridyl)pyrrolidine	= Nicotine
3-Methyl-2-butanone	= 3-Methyl-2-butanone
2-Methyl-2-butyne	= 2-Methyl-2-hydroxy-3-butyne
1-Methyl-2-chlorobenzene	= o-Chlorotoluene
1-Methyl-2-fluorobenzene	= 2-Fluorotoluene
2-Methyl-2-hydroxy-3-butyne	= 2-Methyl-2-hydroxy-3-butyne
1-Methyl-2-hydroxyethylamine	= 2-Propanolamine

SYNONYM	COMPOUND NAMES
2-Methyl-2-methoxy propane	= Methyl tert-butyl ether
4-Methyl-2-pentanol acetate	= Methyl amyl acetate
4-Methyl-2-pentanol	= Methyl amyl alcohol
4-Methyl-2-pentanol	= Methyl isobutyl carbinol
4-Methyl-2-pentanone	= Methyl isobutyl ketone
4-Methyl-2-pentyl acetate	= Methyl amyl acetate
2-Methyl-2-propanol	= tert-Butyl alcohol
2-Methyl-2-propen-1-ol	= Methyl allyl alcohol
1-Methyl-2-pyrrolidinone	= 1-Methylpyrrolidone
3-(1-Methyl-2-pyrrolidyl)pyridine	= Nicotine
1-Methyl-2, 4-dinitrobenzene	= 2,4-Dinitrotoluene
2-Methyl-2,4-pentanediol	= Hexylene glycol
2-Methyl-3-buten-2-ol	= Methyl butenol
2-Methyl-3-buten-2-ol	= Methyl butynol
1-Methyl-3-fluorobenzene	= 3-Fluorotoluene
Methyl-3-oxo-butyrate	= Methyl acetoacetate
4-Methyl-3-pentene-2-one	= Mesityl oxide
1-Methyl-4-isopropylbenzene	= p-Cymene
4-Methyl-4-pentene	= 2-Methyl-1-pentene
1-Methyl-4-tert-butylbenzene	= Butyl toluene
2-Methyl-6-ethyl aniline	= 2-Methyl-6-ethyl aniline
2-Methyl-6-ethylbenzeneamine	= 2-Methyl-6-ethyl aniline
2-Methyl-6-methylene-2,7-octadiene	= Myrcene
N-Methyl-alpha-pyrrolidone	= 1-Methylpyrrolidone
3-Methyl-buten-(1)-ol(3)	= Methyl butenol
Methyl-n-butanoate	= Methyl butyrate
Methyl-n-butyrate	= Methyl butyrate
p-Methyl-tert-butylbenzene	= Butyl toluene
Methyl 2-methyl-2-propenoate	= Methyl methacrylate
Methyl 2-propenoate	= Methyl acrylate
Methyl a-methylacrylate	= Methyl methacrylate
Methyl acetaldehyde	= Propionaldehyde
Methyl acetate	= Methyl acetate
Methyl acetoacetate	= Methyl acetoacetate
Methyl acetylacetonate	= Methyl acetoacetate
Methyl acetylene, propadiene mixture	= Methyl acetylene, propadiene mixture
Methyl acrylate	= Methyl acrylate
Methyl adipate	= Dimethyl adipate
Methyl alcohol	= Methyl alcohol
Methyl allyl alcohol	= Methyl allyl alcohol
Methyl amyl acetate	= Methyl amyl acetate
Methyl amyl alcohol	= Methyl amyl alcohol
Methyl amyl ketone	= n-Amyl methyl ketone
alpha-Methyl benzene methanol	= a-Methylbenzyl alcohol
Methyl benzenecarboxylate	= Methyl benzoate
Methyl benzoate	= Methyl benzoate
Methyl bromide	= Methyl bromide
3-Methyl butan-2-one	= 3-Methyl-2-butanone
Methyl butenol	= Methyl butenol
Methyl butynol	= 2-Methyl-2-hydroxy-3-butyne
Methyl butynol	= Methyl butynol
Methyl butyrate	= Methyl butyrate
Methyl carbitol acetate	= Diethylene glycol methyl ether acetate
Methyl carbitol	= Diethylene glycol monomethyl ether

SYNONYM	COMPOUND NAMES
Methyl carbonimide	= Methyl isocyanate
Methyl cellosolve acetate	= Ethylene glycol methyl ether acetate
Methyl cellosolve	= Ethylene glycol monomethyl ether
Methyl chloride	= Methyl chloride
Methyl chloroacetate	= Methyl chloroacetate
Methyl chlorocarbonate	= Methyl chloroformate
Methyl chloroformate	= Methyl chloroformate
Methyl chloromethyl ether, anhydrous	= Chloromethyl methyl ether
Methyl cyanide	= Acetonitrile
Methyl cyclopentane	= Methyl cyclopentane
Methyl dichloroacetate	= Methyl dichloroacetate
Methyl dichloroethanoate	= Methyl dichloroacetate
Methyl diethanolamine	= Methyl diethanolamine
N-Methyl ethanolamine	= Monomethyl ethanolamine
Methyl ether	= Dimethyl ether
Methyl ethyl bromo-methane	= 2-Bromobutane
Methyl ethyl ketone	= Methyl ethyl ketone
Methyl formal	= Methyl formal
Methyl formate	= Methyl formate
Methyl heptyl ketone	= Methyl heptyl ketone
Methyl iodide	= Methyl iodide
Methyl isobutenyl ketone	= Mesityl oxide
Methyl isobutyl carbinol	= Methyl isobutyl carbinol
Methyl isobutyl ketone	= Methyl isobutyl ketone
Methyl isocyanate	= Methyl isocyanate
Methyl isopropenyl ketone	= Methyl isopropenyl ketone
Methyl isopropyl ketone	= 3-Methyl-2-butanone
Methyl isothiocyanate	= Methyl isothiocyanate
Methyl mercaptan	= Methyl mercaptan
Methyl methacrylate	= Methyl methacrylate
Methyl monochloroacetate	= Methyl chloroacetate
Methyl mustard oil	= Methyl isothiocyanate
Methyl n-amyl ketone	= Methylamyl ketone
Methyl n-butyl ketone	= Methyl n-butyl ketone
Methyl n-propyl ketone	= 2-Pentanone
2-Methyl nitrobenzene	= o-Nitrotoluene
Methyl nitrobenzene	= p-Nitrotoluene
Methyl parathion	= Methyl parathion
2-Methyl pentene-1	= 2-Methyl-1-pentene
Methyl pentyl ketone	= n-Amyl methyl ketone
Methyl phenyl ketone	= Acetophenone
Methyl phosphite	= Trimethyl phosphite
Methyl phosphonothioic dichloride	= Methyl phosphonothioic dichloride
Methyl phthalate	= Dimethyl phthalate
2-Methyl propenic acid	= Methacrylic acid
Methyl propyl ketone	= Methyl propyl ketone
Methyl salicylate	= Methyl salicylate
Methyl sulfate	= Dimethyl sulfate
Methyl sulfhydrate	= Methyl mercaptan
Methyl sulfide	= Dimethyl sulfide
Methyl sulfoxide	= Dimethyl sulfoxide
Methyl tert-butyl ether	= Methyl tert-butyl ether
Methyl thiram	= Thiram
Methyl tribromide	= Bromoform

SYNONYM	COMPOUND NAMES
Methyl tuads	= Thiram
Methyl vinyl ether	= Vinyl methyl ether
Methyl vinyl ketone	= Methyl vinyl ketone
Methylacetic acid	= Propionic acid
Methylacetic anhydride	= Propionic anhydride
Methylacetylene-allene mixture	= Methyl acetylene, propadiene mixture
beta-Methylacrolein	= Crotonaldehyde
alpha-Methylacrylic acid	= Methacrylic acid
2-Methylacrylic acid	= Methacrylic acid
2-Methylactonitrile	= Acetone cyanohydrin
Methylal	= Methyl formal
beta-Methylallyl chloride	= Methallyl chloride
Methylamine solution	= Methylamine solution
Methylamine	= Methylamine
2-(Methylamino)ethanol	= Monomethyl ethanolamine
N-Methylaminobenzene	= N-Methylaniline
Methylamyl alcohol	= Methyl isobutyl carbinol
Methylamyl ketone	= Methylamyl ketone
Methylaniline (mono)	= N-Methylaniline
m-Methylaniline	= m-Toluidine
3-Methylaniline	= m-Toluidine
N-Methylaniline	= N-Methylaniline
2-Methylaniline	= o-Toluidine
o-Methylaniline	= o-Toluidine
p-Methylaniline	= p-Toluidine
4-Methylaniline	= p-Toluidine
2-Methylaziridine	= Propyleneimine
Methylbenzene	= Toluene
3-Methylbenzeneamine	= m-Toluidine
4-Methylbenzeneamine	= p-Toluidine
Methylbenzenesulfonic acid	= p-Toluenesulfonic acid
Methylbenzol	= Toluene
a-Methylbenzyl alcohol	= a-Methylbenzyl alcohol
alpha-Methylbivinyll	= 1,3-Pentadiene
beta-Methylbivinyll	= Isoprene
1-Methylbutadiene	= 1,3-Pentadiene
3-Methylbutanal	= Isovaleraldehyde
2-Methylbutane	= Isopentane
3-Methylbutyl nitrite	= iso-Amyl nitrite
3-Methylbutyraldehyde	= Isovaleraldehyde
Methylcarbamate	= Carbofuran
Methylchloroform	= Trichloroethane
Methylcyclohexane	= Methylcyclohexane
2-Methylcyclohexanol	= 2-Methylcyclohexanol
o-Methylcyclohexanone	= o-Methylcyclohexanone
2-Methylcyclohexanone	= o-Methylcyclohexanone
Methylcyclopentadiene dimer	= Methylcyclopentadiene dimer
Methylcyclopentadienylmanganese tricarbonyl	= Methylcyclopentadienylmanganese tricarbonyl
Methyldichlorosilane	= Methyldichlorosilane
3-Methylene-7-methyl 1,6-octadiene	= Myrcene
Methylene bromide	= Dibromomethane
Methylene chloride	= Dichloromethane
Methylene cyanide	= Propanedinitrile

SYNONYM	COMPOUND NAMES
Methylene dibromide	= Dibromomethane
Methylene dichloride	= Dichloromethane
Methylene dimethyl ether	= Methyl formal
Methylene tribromide	= Bromoform
2,2-Methylene, bis[3,4,6-trichlorophenol]	= Hexachlorophene
bis-(1-Methylethyl)-benzene	= Diisopropylbenzene (all isomers)
bis-(1-Methylethyl) ester	= Isopropyl percarbonate
o-Methylethylbenzene	= 2-Ethyl toluene
Methylethylcarbinol	= sec-Butyl alcohol
1-Methylethylcyclohexane	= Isopropyl cyclohexane
Methylethylene glycol	= Propylene glycol
Methylethylene	= Propylene
2-Methylethyleneimine	= Propyleneimine
Methylethylketone peroxide	= 2-Butanone peroxide
Methylethylpyridine	= Methylethylpyridine
Bis-(6-Methylheptyl) phthalate	= Diisooctyl phthalate
Methylhydrazine	= Methylhydrazine
p-Methylhydroxybenzene	= p-Cresol
2,2'-Methyliminodiethanol	= Methyl diethanolamine
Methylisobutylcarbinol	= Methyl amyl alcohol
Methylisobutylcarbonyl acetate	= Methyl amyl acetate
Methylmethane	= Ethane
alpha-Methylnaphthalene	= 1-Methylnaphthalene
1-Methylnaphthalene	= 1-Methylnaphthalene
3-Methylnitrobenzene	= m-Nitrotoluene
4-Methylnitrobenzene	= p-Nitrotoluene
Methyloxirane	= Propylene oxide
2-Methylpentane	= Isohexane
Methylphenols	= Cresols
m-Methylphenol	= m-Cresol
2-Methylphenol	= o-Cresol
p-Methylphenol	= p-Cresol
Methylphenyl methanol	= a-Methylbenzyl alcohol
Methylphenylamine	= N-Methylaniline
2-Methylpropanal	= iso-butyraldehyde
2-Methylpropane	= Isobutane
2-Methylpropanenitrile	= Isobutyronitrile
2-Methylpropanoic acid	= Isobutyric acid
2-Methylpropene	= Isobutylene
alpha-Methylpropionic acid	= Isobutyric acid
2-Methylpropionitrile	= Isobutyronitrile
beta-Methylpropyl ethanoate	= Isobutyl acetate
N,N-bis(2-Methylpropyl)amine	= Diisobutylamine
Methylpropylbenzene	= p-Cymene
2-Methylpyridine	= 2-Methylpyridine
alpha-Methylpyridine	= 2-Methylpyridine
3-Methylpyridine	= 3-Methylpyridine
4-Methylpyridine	= 4-Methylpyridine
N-Methylpyrrolidinone	= 1-Methylpyrrolidone
N-Methylpyrrolidone	= 1-Methylpyrrolidone
1-Methylpyrrolidone	= 1-Methylpyrrolidone
alpha-Methylstyrene	= alpha-Methylstyrene
p-Methylstyrene	= Vinyl toluene
4-(Methylsulfonyl)-2,6-dinitro	= Nitralin



SYNONYM	COMPOUND NAMES
Methyltrichlorosilane	= Methyltrichlorosilane
Methylzinc	= Dimethylzinc
Metolachlor	= Metolachlor
Metron	= Methyl parathion
Mevinphos	= Phosdrin
Mexacarbate	= Zectran
MFB	= Fluorobenzene
MHA-FA	= 2-Hydroxy-4-(methylthio)-butanoic acid
MHA acid	= 2-Hydroxy-4-(methylthio)-butanoic acid
MIBC	= Methyl isobutyl carbinol
MIBK	= Methyl isobutyl ketone
MIC	= Methyl amyl alcohol
MIC	= Methyl isobutyl carbinol
MIC	= Methyl isocyanate
Middle oil	= Carbolic oil (mixture)
MIK	= Methyl isobutyl ketone
Mild mercury chloride	= Mercurous chloride
Milk acid	= Lactic acid
Milk white	= Lead sulfate
Milocep	= Metolachlor
Mineral carbon	= Charcoal
Mineral colza oil	= Oils, miscellaneous: mineral seal
Mineral spirits	= Mineral spirits
Mipax	= Dimethyl phthalate
Mirex	= Mirex
Mitis green	= Copper acetoarsenite
Mixed fertilizers	= Ammonium nitrate-sulfate mixture
Mixed primary amyl nitrates	= n-Amyl nitrate
Mixture of benzene, toluene, xylenes	= Naphtha: coal tar
MMH	= Methylhydrazine
Mohr's salt	= Ferrous ammonium sulfate
Molybdenum trioxide	= Molybdic trioxide
Molybdic acid (85%)	= Ammonium molybdate
Molybdic anhydride	= Molybdic trioxide
Molybdic trioxide	= Molybdic trioxide
Mondur TDS	= Toluene 2,4-diisocyanate
Mono-n-propylamine	= n-Propylamine
Mono PE	= Pentaerythritol
Monoammonium orthophosphate	= Ammonium phosphate
Monobromoacetone	= Bromoacetone
Monobromobenzene	= Bromobenzene
Monobromomethane	= Methyl bromide
Monocalcium phosphate monohydrate	= Calcium phosphate
Monochlorethane	= Ethyl chloride
Monochlorethanoic acid, ethyl ester	= Ethyl chloroacetate
Monochloroacetaldehyde	= Chloroacetaldehyde
Monochloroacetic acid, methyl ester	= Methyl chloroacetate
Monochloroacetic acid	= Chloroacetic acid
Monochloroacetic acid	= Chloroacetic acid (80% or less)
Monochlorobenzene	= Chlorobenzene
Monochlorodifluoromethane	= Chlorodifluoromethane
Monochloromethyl ether	= Chloromethyl methyl ether
beta-Monochloropropionic acid	= 3-Chloropropionic acid
Monochlorotetrafluoroethane	= Monochlorotetrafluoroethane

SYNONYM	COMPOUND NAMES
Monochlorotrifluoromethane	= Monochlorotrifluoromethane
Monoethanolamine	= Monoethanolamine
Monoethylamine	= Ethylamine
Monoethylene glycol	= Ethylene glycol
Monofluorobenzene	= Fluorobenzene
Monofluoroethylene	= Vinyl fluoride
Monoglyme	= Ethylene glycol dimethyl ether
Monoiodomethane	= Methyl iodide
Monoisobutylamine	= Isobutylamine
Monoisopropanolamine	= Monoisopropanolamine
Monoisopropylamine	= Isopropylamine
Monomethyl ethanolamine	= Monomethyl ethanolamine
Monomethylamine	= Methylamine
Monomethylamine	= Methylamine solution
Monomethylhydrazine	= Methylhydrazine
Mononitrogen monoxide	= Nitric oxide
Monosodium methane arsonate	= Methanearsonic acid, sodium salt
Monosodium methyl arsonate	= Methanearsonic acid, sodium salt
Monoxide	= Carbon monoxide
Morpholine	= Morpholine
Mortopal	= Tetraethyl pyrophosphate
Moss green	= Copper acetoarsenite
Motor oil	= Oils, miscellaneous: lubricating
Motor spirit	= Gasolines: automotive (<4.23g lead/gal)
Mouse-tox	= Strychnine
MPT	= Methyl parathion
MPTD	= Methyl phosphonothioic dichloride
MSMA	= Methanearsonic acid, sodium salt
Multrathane M	= Diphenylmethane diisocyanate
Muriatic acid	= Hydrochloric acid
Myrcene	= Myrcene
Myristic alcohol	= Tetradecanol
Myristyl alcohol	= Tetradecanol
NA 1760 (DOT)	= Hexanoic acid
Nabam	= Nabam
Nacap	= Sodium 2-mercaptobenzothiazol solution
Naccanol NR or SW	= Dodecyl benzene sulfonic acid, sodium salt
Nacconate 100	= Toluene 2,4-diisocyanate
Nacconate 300	= Diphenylmethane diisocyanate
Nacconol 988 A	= Dodecylbenzenesulfonic acid
Nadone	= Cyclohexanone
Naled	= Naled
Naphtha: coal tar	= Naphtha: coal tar
Naphtha: solvent	= Naphtha: solvent
Naphtha: stoddard solvent	= Naphtha: stoddard solvent
Naphtha: VM & P	= Naphtha: VM & P
Naphtha	= Mineral spirits
Naphthalene	= Naphthalene
Naphthalin	= Naphthalene
Naphthane	= Decahydronaphthalene
Naphthenic acids	= Naphthenic acids
1-Naphthyl n-methylcarbamate	= Carbaryl
alpha-Naphthylamine	= 1-Naphthylamine

SYNONYM	COMPOUND NAMES
1-Naphthylamine	= 1-Naphthylamine
Naphtol as-kg	= p-Toluidine
Napthalane	= Decahydronaphthalene
Natural gas	= Methane
Natural gasoline	= Gasolines: casinghead
Naugatuck DO 14	= Propargite
NCI-C 54773	= Dimethyl hydrogen phosphite
NCI-C06155	= Butyl chloride
NCI-C06508	= Benzyl acetate
NCI - C55947	= Tetranitromethane
NCL-C56188	= 2,6-Dimethylaniline
Necatorina	= Carbon tetrachloride
Neo-fat 10	= Decanoic acid
Neo-fat 12-43	= Lauric acid
Neo-fat 8	= Octanoic acid
Neodecanoic acid, vinyl ester	= Vinyl neodecanoate
Neodecanoic acid	= Neodecanoic acid
Neofat 12	= Lauric acid
Neohexane	= Neohexane
Neol	= 2,2-Dimethylpropane-1,3-diol
Neopentanoic acid	= Trimethylacetic acid
Neopentyl glycol	= 2,2-Dimethylpropane-1,3-diol
Neopentylene glycol	= 2,2-Dimethylpropane-1,3-diol
Nerkol	= Dichlorvos
Neutral ammonium chromate	= Ammonium chromate
Neutral ammonium fluoride	= Ammonium fluoride
Neutral anhydrous calcium hypochlorite	= Calcium hypochlorite
Neutral lead acetate	= Lead acetate
Neutral lead stearate	= Lead stearate
Neutral nicotine sulfate	= Nicotine sulfate
Neutral potassium chromate	= Potassium chromate
Neutral sodium chromate anhydrous	= Sodium chromate
Neutral verdigris	= Copper acetate
NIA 12 40	= Ethion
NIA 5996	= Dichlobenil
Niagara 10242	= Carbofuran
Nialate	= Ethion
Nickel (II) fluoborate	= Nickel fluoroborate
Nickel acetate tetrahydrate	= Nickel acetate
Nickel acetate	= Nickel acetate
Nickel ammonium sulfate hexahydrate	= Nickel ammonium sulfate
Nickel ammonium sulfate	= Nickel ammonium sulfate
Nickel bromide trihydrate	= Nickel bromide
Nickel bromide	= Nickel bromide
Nickel carbonyl	= Nickel carbonyl
Nickel chloride hexahydrate	= Nickel chloride
Nickel chloride	= Nickel chloride
Nickel cyanide	= Nickel cyanide
Nickel dihydroxide	= Nickel hydroxide
Nickel fluoroborate solution	= Nickel fluoroborate
Nickel fluoroborate	= Nickel fluoroborate
Nickel formate dihydrate	= Nickel formate
Nickel formate	= Nickel formate
Nickel hydroxide	= Nickel hydroxide

SYNONYM	COMPOUND NAMES
Nickel nitrate hexahydrate	= Nickel nitrate
Nickel nitrate	= Nickel nitrate
Nickel sulfate	= Nickel sulfate
Nickel tetracarbonyl	= Nickel carbonyl
Nickelous acetate	= Nickel acetate
Nickelous hydroxide	= Nickel hydroxide
Nickelous sulfate	= Nickel sulfate
Nicotine sulfate	= Nicotine sulfate
Nicotine	= Nicotine
Niobe oil	= Methyl benzoate
Nitos	= Tetraethyl pyrophosphate
Nitralin	= Nitralin
Nitram	= Ammonium nitrate
Nitran	= Methyl parathion
o-Nitraniline	= 2-Nitroaniline
Nitratine	= Sodium nitrate
Nitrex nitrogen solutions (non-pressure)	= Ammonium nitrate-urea solution
Nitric acid, aluminum salt	= Aluminum nitrate
Nitric acid, iron(III) salt	= Ferric nitrate
Nitric acid, lead II salt	= Lead nitrate
Nitric acid, thallium (I) salt	= Thallium nitrate
Nitric acid, thallos salt	= Thallium nitrate
Nitric acid	= Nitric acid
Nitric oxide	= Nitric oxide
Nitrilotriacetic acid and salts	= Nitrilotriacetic acid and salts
2-Nitroaniline	= 2-Nitroaniline
o-Nitroaniline	= 2-Nitroaniline
p-Nitroaniline	= 4-Nitroaniline
4-Nitroaniline	= 4-Nitroaniline
Nitrobenzene	= Nitrobenzene
Nitrobenzol	= Nitrobenzene
Nitrocarbol	= Nitromethane
Nitrocellulose gum	= Collodion
Nitrocellulose solution	= Collodion
o-Nitrochlorobenzene	= o-Chloronitrobenzene
Nitrochloroform	= Chloropicrin
Nitroethane	= Nitroethane
Nitrogen dioxide	= Nitrogen tetroxide
Nitrogen monoxide	= Nitric oxide
Nitrogen peroxide	= Nitrogen tetroxide
Nitrogen tetroxide	= Nitrogen tetroxide
Nitrogen	= Nitrogen
Nitromagnesite	= Magnesium nitrate
Nitromethane	= Nitromethane
o-Nitrophenol	= 2-Nitrophenol
2-Nitrophenol	= 2-Nitrophenol
3-Nitrophenol	= 3-Nitrophenol
m-Nitrophenol	= 3-Nitrophenol
p-Nitrophenol	= 4-Nitrophenol
4-Nitrophenol	= 4-Nitrophenol
1-Nitropropane	= 1-Nitropropane
2-Nitropropane	= 2-Nitropropane
sec-Nitropropane	= 2-Nitropropane
Nitrosyl chloride	= Nitrosyl chloride

SYNONYM	COMPOUND NAMES
3-Nitrotoluene	= m-Nitrotoluene
m-Nitrotoluene	= m-Nitrotoluene
o-Nitrotoluene	= o-Nitrotoluene
2-Nitrotoluene	= o-Nitrotoluene
p-Nitrotoluene	= p-Nitrotoluene
3-Nitrotoluol	= m-Nitrotoluene
4-Nitrotoluol	= p-Nitrotoluene
Nitrotrichloromethane	= Chloropicrin
Nitrous ether	= Ethyl nitrite
Nitrous oxide	= Nitrous oxide
No. 4	= Oils, fuel: 4
No. 5	= Oils, fuel: 5
No. 6	= Oils, fuel: no. 6
Nonan-2-one	= Methyl heptyl ketone
Nonane	= Nonane
n-Nonane	= Nonane
Nonanol acetate	= Nonyl acetate
Nonanol	= Nonanol
1-Nonanol	= Nonanol
5-Nonanone	= Di-n-butyl ketone
2-Nonanone	= Methyl heptyl ketone
Nonene (non-linear)	= Nonene
Nonene (nonlinear)	= Propylene trimer
1-Nonene	= 1-Nonene
Nonene	= Nonene
Nonene	= Propylene trimer
Nonyl acetate	= Nonyl acetate
n-Nonyl acetate	= Nonyl acetate
Nonyl alcohol/pelargonic alcohol	= Nonanol
Nonyl alcohol	= Nonanol
Nonylcarbinol	= n-Decyl alcohol
1-Nonylene	= 1-Nonene
n-Nonylethylene	= 1-Undecene
Nonylphenol	= Nonylphenol
S-Noranone	= Di-n-butyl ketone
Normal lead acetate	= Lead acetate
Normenthane	= Isopropyl cyclohexane
Norvalamine	= n-Butylamine
2-NP	= 2-Nitropropane
NTA	= Nitritotriacetic acid and salts
NTM	= Dimethyl phthalate
Nuoplaz	= Ditridecyl phthalate
Nux-vomica	= Strychnine
O,O-Diethyl O-(p-nitrophenyl) phosphorothioate	= Parathion
O,O[diethyl-o(and 5)-]2- (ethylthio)ethyl[phosphorothioate s	= Demeton
Octa-klor	= Chlordane
1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a- hexahydro-4,7-methanoindene	= Chlordane
Octachlorocamphene	= Toxaphene
Octadecanoic acid	= Stearic acid
cis-9-Octadecenoic acid	= Oleic acid

SYNONYM	COMPOUND NAMES
n-Octadecylic acid	= Stearic acid
1,6-Octadiene, 7-methyl-3-methylene	= Myrcene
1-Octanal	= Octyl aldehydes
Octane	= Octane
n-Octane	= Octane
Octanoic acid	= Octanoic acid
Octanol	= Octanol
1-Octanol	= Octanol
3-Octanone	= Ethyl amyl ketone
1-Octene	= 1-Octene
n-Octoic acid	= Octanoic acid
Octoil	= Dioctyl phthalate
Octycarbinol	= Nonanol
n-Octyl-n-decyl phthalate	= Octyl decyl phthalate
Octyl acetate	= 2-Ethylhexyl acetate
Octyl alcohol	= Octanol
Octyl aldehyde	= Ethylhexaldehyde
n-Octyl aldehyde	= Octyl aldehydes
Octyl aldehydes	= Octyl aldehydes
Octyl decyl phthalate	= Octyl decyl phthalate
Octyl epoxy tallate	= Octyl epoxy tallate
alpha-Octylene	= 1-Octene
Oil of bitter almond	= Benzaldehyde
Oil of cashew nutshell	= Oil, misc: cashew nut shell
Oil of mirbane	= Nitrobenzene
Oil of Niobe	= Methyl benzoate
Oil of vitriol	= Sulfuric acid
Oil, misc: cashew nut shell	= Oil, misc: cashew nut shell
Oil, misc: pine	= Oil, misc: pine
Oils, edible: castor	= Oils, edible: castor
Oils, edible: coconut	= Oils, edible: coconut
Oils, edible: cottonseed	= Oils, edible: cottonseed
Oils, edible: fish	= Oils, edible: fish
Oils, edible: lard	= Oils, edible: lard
Oils, edible: olive	= Oils, edible: olive
Oils, edible: palm	= Oils, edible: palm
Oils, edible: peanut	= Oils, edible: peanut
Oils, edible: safflower	= Oils, edible: safflower
Oils, edible: soya bean	= Oils, edible: soya bean
Oils, edible: tucum	= Oils, edible: tucum
Oils, edible: vegetable	= Oils, edible: vegetable
Oils, fuel: 1-D	= Oils, fuel: 1-D
Oils, fuel: 2-D	= Oils, fuel: 2-D
Oils, fuel: 2	= Oils, fuel: 2
Oils, fuel: 4	= Oils, fuel: 4
Oils, fuel: 5	= Oils, fuel: 5
Oils, fuel: no. 1	= Oils, fuel: no. 1
Oils, fuel: no. 6	= Oils, fuel: no. 6
Oils, miscellaneous: absorption	= Oils, miscellaneous: absorption
Oils, miscellaneous: coal tar	= Oils, miscellaneous: coal tar
Oils, miscellaneous: croton	= Oils, miscellaneous: croton
Oils, miscellaneous: linseed	= Oils, miscellaneous: linseed
Oils, miscellaneous: lubricating	= Oils, miscellaneous: lubricating
Oils, miscellaneous: mineral seal	= Oils, miscellaneous: mineral seal

SYNONYM	COMPOUND NAMES
Oils, miscellaneous: mineral	= Oils, miscellaneous: mineral
Oils, miscellaneous: motor	= Oils, miscellaneous: motor
Oils, miscellaneous: neatsfoot	= Oils, miscellaneous: neatsfoot
Oils, miscellaneous: penetrating	= Oils, miscellaneous: penetrating
Oils, miscellaneous: range	= Oils, miscellaneous: range
Oils, miscellaneous: resin	= Oils, miscellaneous: resin
Oils, miscellaneous: road	= Oils, miscellaneous: road
Oils, miscellaneous: rosin	= Oils, miscellaneous: rosin
Oils, miscellaneous: sperm	= Oils, miscellaneous: sperm
Oils, miscellaneous: spindle	= Oils, miscellaneous: spindle
Oils, miscellaneous: spray	= Oils, miscellaneous: spray
Oils, miscellaneous: tall	= Oils, miscellaneous: tall
Oils, miscellaneous: tanner's	= Oils, miscellaneous: tanner's
Oils, miscellaneous: transformer	= Oils, miscellaneous: transformer
Oils, miscellaneous: turbine	= Oils, miscellaneous: turbine
Oils: clarified	= Oils: clarified
Oils: crude	= Oils: crude
Oils: diesel	= Oils: diesel
Olefiant gas	= Ethylene
Oleic acid, ammonium salt	= Ammonium oleate
Oleic acid, potassium salt	= Oleic acid, potassium salt
Oleic acid, sodium salt	= Oleic acid, sodium salt
Oleic acid	= Oleic acid
Oleum abietis	= Oil, misc: pine
Oleum	= Oleum
Omal	= Trichlorophenol
Omite	= Propargite
ONA	= 2-Nitroaniline
ONP	= 2-Nitrophenol
Ontrack 8e	= Metolachlor
Orpiment	= Arsenic trisulfide
Orthoarsenic acid	= Arsenic acid
Orthoboric acid	= Boric acid
Orthocide	= Captan
Orthophosphoric acid	= Phosphoric acid
Orthotitanic acid, tetrabutyl ester	= Tetrabutyl titanate
3-Oxa-1, 5-pentanediol	= Diethylene glycol
Oxacetic acid	= Glyoxylic acid (50% or less)
Oxacyclopentadiene	= Furan
Oxal	= Glyoxal
Oxaldehyde	= Glyoxal
Oxalic acid dinitrile	= Cyanogen
Oxalic acid, diammonium salt	= Ammonium oxalate
Oxalic acid, ferrous salt	= Ferrous oxalate
Oxalic acid	= Oxalic acid
Oxalonitrile	= Cyanogen
Oxammonium sulfate	= Hydroxylamine sulfate
Oxammonium	= Hydroxylamine
2-Oxetanone	= beta-Propiolactone
Oxidate LE	= Methyl benzoate
Oxides of nitrogen	= Nitrogen tetroxide
Oxirane	= Ethylene oxide
Oxo octaldehyde	= Isooctaldehyde
Oxo octyl alcohol	= Isooctyl alcohol

SYNONYM	COMPOUND NAMES
3-Oxobutanoic acid methyl ester	= Methyl acetoacetate
alpha-Oxodiphenylmethane	= Benzophenone
alpha-Oxoditane	= Benzophenone
Oxoethanoic acid	= Glyoxylic acid (50% or less)
2-Oxohexamethylenimine	= Caprolactam
Oxole	= Furan
Oxotridecyl alcohol	= Tridecanol
1,1'-[Oxybis(methylene)] bis benzene	= Dibenzyl ether
2,2'-Oxybisethanol	= Diethylene glycol
Oxygen	= Oxygen
Oxylite	= Dibenzoyl peroxide
Oxyphenic acid	= Catechol
Oxytoluenes	= Cresols
Paint drier	= Copper naphthenate
Painter's naphtha	= Naphtha: VM & P
Palm butter	= Oils, edible: palm
Palm fruit oil	= Oils, edible: palm
Palm oil	= Oils, edible: palm
Palm seed oil	= Oils, edible: tucum
PAN	= Phthalic anhydride
Paper maker's alum	= Aluminum sulfate solution
PAPI	= Polymethylene polyphenyl isocyanate
Paracetaldehyde	= Paraldehyde
Paradi	= p-Dichlorobenzene
Paradichlorobenzene	= p-Dichlorobenzene
Paradow	= p-Dichlorobenzene
Paraformaldehyde	= Paraformaldehyde
Paraldehyde	= Paraldehyde
Paramoth	= p-Dichlorobenzene
Paranaphthalene	= Anthracene
Parathion-methyl	= Methyl parathion
Parathion	= Parathion
Paridol	= Methyl parathion
Paris green	= Copper acetoarsenite
Parrot green	= Copper acetoarsenite
Patent aluminum	= Aluminum sulfate
PCB	= Polychlorinated biphenyl
PE	= Pentaerythritol
Pear oil	= Isoamylacetate
Pear oil	= sec-Amyl acetate
Pearl white	= Bismuth oxychloride
Penta-1,4-diene	= 1,4-Pentadiene
Penta	= Pentachlorophenol
Pentaborane	= Pentaborane
(9)-Pentaboron nonahydride	= Pentaborane
Pentachloroethane	= Pentachloroethane
Pentachlorophenol	= Pentachlorophenol
Pentachlorophenyl chloride	= Hexachlorobenzene
o-Pentadecadienyl salicylic acid	= Oil, misc: cashew nut shell
Pentadecanol	= Linear alcohols
Pentadecanol	= Pentadecanol
1-Pentadecanol	= Pentadecanol
Pentadecyl alcohol	= Pentadecanol
trans-Pentadiene-1,3	= 1,3-Pentadiene



SYNONYM	COMPOUND NAMES
cis-Pentadiene-1,3	= 1,3-Pentadiene
1,3-Pentadiene	= 1,3-Pentadiene
1,4-Pentadiene	= 1,4-Pentadiene
Pentaerythrite	= Pentaerythritol
Pentaerythritol	= Pentaerythritol
Pentaethylene hexamine	= Pentaethylenehexamine
Pentaethylenehexamine	= Pentaethylenehexamine
Pentalin	= Pentachloroethane
Pentamethylene	= Cyclopentane
Pentanal	= n-Valeraldehyde
Pentanal	= Valeraldehyde
Pentane	= Pentane
1,5-Pentanedial	= Glutaraldehyde solution
2,4-Pentanedione	= Acetylacetone
1-Pentanethiol	= n-Amyl mercaptan
Pentanoic acid	= Pentanoic acid
1-Pentanol	= n-Amyl alcohol
2-Pentanone	= 2-Pentanone
3-Pentanone	= Diethyl ketone
2-Pentanone	= Methyl propyl ketone
Pentek	= Pentaerythritol
1-Pentene	= 1-Pentene
tert-Pentyl acetate	= tert-Amyl acetate
Pentyl acetates	= Amyl acetate (all isomers)
Pentyl alcohol	= n-Amyl alcohol
1-Pentyl chloride	= n-Amyl chloride
Pentyl methyl ketone	= n-Amyl methyl ketone
n-Pentyl propionate	= n-Pentyl propionate
2-Pentylacetate	= sec-Amyl acetate
2-Pentylbromide	= 2-Bromopentane
sec-Pentylcarbinol	= Ethyl butanol
Pentylformic acid	= Hexanoic acid
Pentylsilicon trichloride	= n-Amyltrichlorosilane
Peracetic acid	= Peracetic acid
Percarbamide	= Urea peroxide
Perchloric acid solution	= Perchloric acid
Perchloric acid	= Perchloric acid
Perchlorobenzene	= Hexachlorobenzene
Perchlorobutadiene	= Hexachlorobutadiene
Perchlorocyclopentadiene	= Hexachlorocyclopentadiene
Perchlorodihomocubane	= Mirex
Perchloroethane	= Hexachloroethane
Perchloroethylene	= Tetrachloroethylene
Perchloromethane	= Carbon tetrachloride
Perchloromethyl mercaptan	= Perchloromethyl mercaptan
Perclene	= Tetrachloroethylene
Perhydronapthalene	= Decahydronaphthalene
Perk	= Tetrachloroethylene
Peroxide	= Hydrogen peroxide
Peroxyacetic acid	= Peracetic acid
Peroxydicarbonic acid,	= Isopropyl percarbonate
Peroxydisulfuric acid, diammonium salt	= Ammonium persulfate
Persian-insect powder	= Pyrethrins
Petrohol	= Isopropyl alcohol

SYNONYM	COMPOUND NAMES
Petrol	= Gasolines: automotive (<4.23g lead/gal)
Petrolatum jelly	= Petrolatum
Petrolatum	= Petrolatum
Petroleum asphalt	= Asphalt
Petroleum asphalt	= Oils, miscellaneous: road
Petroleum distillate	= Distillates: flashed feed stocks
Petroleum distillate	= Distillates: straight run
Petroleum insulating oil	= Oils, miscellaneous: transformer
Petroleum jelly	= Petrolatum
Petroleum naphtha	= Petroleum naphtha
Petroleum pitch	= Asphalt blending stocks: straight run residue
Petroleum residue	= Asphalt blending stocks: straight run residue
Petroleum solvent	= Naphtha: solvent
Petroleum solvent	= Naphtha: stoddard solvent
Petroleum solvent	= Naphtha: VM & P
Petroleum solvent	= Petroleum naphtha
Petroleum spirits	= Mineral spirits
Petroleum tailings	= Asphalt blending stocks: roofers flux
Petroleum wax	= Waxes: paraffin
Petroleum	= Oils: crude
Phellandrene	= Dipentene
Phenachlor	= Trichlorophenol
Phenacyl chloride	= Chloroacetophenone
Phenador-X	= Diphenyl
Phenic acid	= Phenol
Phenol, 2,4,6-trinitro-, ammonium salt	= Ammonium picrate, wet
Phenol, o-chloro-	= o-Chlorophenol
Phenol, o-ethyl	= Ethylphenol
Phenol, pentachloro-, sodium salt	= Sodium pentachlorophenate
Phenol,2-chloro-	= o-Chlorophenol
Phenol	= Phenol
Phenoxybenzene	= Diphenyl ether
2-Phenoxyethanol	= Ethylene glycol phenyl ether
1-Phenyl-1-xylyl ethane	= 1-Phenyl-1-xylyl ethane
Phenyl bromide	= Bromobenzene
Phenyl cellosolve	= Ethylene glycol phenyl ether
Phenyl chloride	= Chlorobenzene
Phenyl chloromethylketone	= Chloroacetophenone
Phenyl ether	= Diphenyl ether
a-Phenyl ethyl alcohol	= a-Methylbenzyl alcohol
Phenyl fluoride	= Fluorobenzene
Phenyl hydroxide	= Phenol
Phenyl mercaptan	= Benzenethiol
Phenyl perchloryl	= Hexachlorobenzene
Phenyl xylyl ethane	= 1-Phenyl-1-xylyl ethane
Phenylamine	= Aniline
N-Phenylaniline	= Diphenylamine
Phenylarsenic dichloride	= Phenylchloroarsine
Phenylbenzene	= Diphenyl
Phenylcarbinol	= Benzyl alcohol
Phenylcyanide	= Benzonitrile
1-Phenyldecane	= n-Decylbenzene

SYNONYM	COMPOUND NAMES
Phenyldichloroarsine	= Phenyldichloroarsine
1-Phenyldodecane	= Dodecylbenzene
Phenylethane	= Ethylbenzene
1-Phenylethanol	= <i>a</i> -Methylbenzyl alcohol
1-Phenylethanone	= Acetophenone
Phenylethylene	= Styrene
Phenylhydrazine hydrochloride	= Phenylhydrazine hydrochloride
Phenylhydrazine	= Phenylhydrazine
Phenylhydrazinium chloride	= Phenylhydrazine hydrochloride
Phenylmercuric acetate	= Phenylmercuric acetate
Phenylmethanol	= Benzyl alcohol
Phenylmethyl acetate	= Benzyl acetate
Phenylmethyl alcohol	= Benzyl alcohol
Phenylmethyl amine	= Benzylamine
Phenylmethyl carbinol	= <i>a</i> -Methylbenzyl alcohol
Phenylphosphine dichloride	= Benzene phosphorus dichloride
Phenylphosphine thiodichloride	= Benzene phosphorus thiodichloride
Phenylphosphonothioic dichloride	= Benzene phosphorus thiodichloride
Phenylphosphonous dichloride	= Benzene phosphorus dichloride
Phenylphosphorus dichloride	= Benzene phosphorus dichloride
1-Phenylpropane	= <i>n</i> -Propylbenzene
Phenylpropylene	= <i>alpha</i> -Methylstyrene
1-Phenyltetradecane	= Tetradecylbenzene
Phenylthiol	= Benzenethiol
1-Phenyltridecane	= Tridecylbenzene
1-Phenylundecane	= <i>n</i> -Undecylbenzene
Phlorol	= Ethylphenol
Phosdrin	= Phosdrin
Phosfene	= Phosdrin
Phosgene	= Phosgene
Phosphinic acid, ammonium salt	= Ammonium hypophosphite
Phosphonic acid, dimethyl ester	= Dimethyl hydrogen phosphite
Phosphoric acid triethyleneimide	= Tris(Aziridinyl)phosphine oxide
Phosphoric acid, tri-butyl ester	= Tributyl phosphate
Phosphoric acid, triethyl ester	= Triethyl phosphate
Phosphoric acid, tris(2-methylphenyl) ester	= Tricresyl phosphate ( $\geq 1\%$ ortho isomer)
Phosphoric acid	= Phosphoric acid
Phosphoric sulfide	= Phosphorus pentasulfide
Phosphorodichloridic acid, ethyl ester	= Ethyl phosphorodichloridate
Phosphorothioic acid, O,O-diethyl-O-p-Nitrophenyl ester	= Parathion
Phosphorous acid, triethyl ester	= Triethyl phosphite
Phosphorous acid	= Trimethyl phosphite
Phosphorus bromide	= Phosphorus tribromide
Phosphorus oxychloride	= Phosphorus oxychloride
Phosphorus pentasulfide	= Phosphorus pentasulfide
Phosphorus persulfide	= Phosphorus pentasulfide
Phosphorus tribromide	= Phosphorus tribromide
Phosphorus trichloride	= Phosphorus trichloride
Phosphorus, black	= Phosphorus, black
Phosphorus, red	= Phosphorus, red
Phosphorus, white	= Phosphorus, white
Phosphoryl chloride	= Phosphorus oxychloride

SYNONYM	COMPOUND NAMES
Photophor	= Calcium phosphide
PHPH	= Diphenyl
Phthalandione	= Phthalic anhydride
Phthalic acid anhydride	= Phthalic anhydride
Phthalic acid, benzyl butyl ether	= Butyl benzyl phthalate
Phthalic acid, bis-(2-ethylhexyl ester)	= Di-(2-ethylhexyl)phthalate
Phthalic acid, bis-(7-methyloctyl) ester	= Diisononyl phthalate
Phthalic acid, bis (2-ethylhexyl ester)	= Dioctyl phthalate
Phthalic acid, bis (8-methyl-nonyl) ester	= Diisodecyl phthalate
Phthalic acid, di-isobutyl ester	= Diisobutyl phthalate
Phthalic acid, diamyl ester	= Amyl phthalate
Phthalic acid, diamyl ester	= Di-n-amyl phthalate
Phthalic acid, dibutyl ester	= Dibutyl phthalate
Phthalic acid, diethyl ester	= Diethyl phthalate
Phthalic acid, diheptyl ester	= Diheptyl phthalate
Phthalic acid, diisodecyl ester	= Diisodecyl phthalate
Phthalic acid, dinonyl ester	= Dinonyl phthalate
Phthalic acid, dipentyl ester	= Amyl phthalate
Phthalic acid, dipentyl ester	= Di-n-amyl phthalate
Phthalic acid, ditridecyl ester	= Ditridecyl phthalate
Phthalic acid, diundecyl ester	= Diundecyl phthalate
m-Phthalic acid	= Isophthalic acid
Phthalic anhydride	= Phthalic anhydride
Phygon-XL	= Dichlone
Phygon	= Dichlone
Phytar	= Sodium cacodylate
Picfume	= Chloropicrin
Picoline	= 2-Methylpyridine
2-Picoline	= 2-Methylpyridine
alpha-Picoline	= 2-Methylpyridine
3-Picoline	= 3-Methylpyridine
m-Picoline	= 3-Methylpyridine
b-Picoline	= 3-Methylpyridine
gamma-Picoline	= 4-Methylpyridine
p-Picoline	= 4-Methylpyridine
4-Picoline	= 4-Methylpyridine
Pigment white 3	= Lead sulfate
Pimelic ketone	= Cyclohexanone
alpha-Pinene	= Pinene
2-Pinene	= Pinene
Pinene	= Pinene
Piperazidine	= Piperazine
1-Piperazine ethanamine	= N-Aminoethyl piperazine
Piperazine	= Piperazine
Piperylene	= 1,3-Pentadiene
Pivalic acid	= Trimethylacetic acid
Planavin	= Nitralin
Plant spray oil	= Oils, miscellaneous: spray
Plastic latex	= Latex, liquid synthetic
Plasticized DDP	= Diisodecyl phthalate
Plumbous arsenate	= Lead arsenate
Plumbous chloride	= Lead chloride
Plumbous fluoride	= Lead fluoride
Plumbous oxide	= Litharge

SYNONYM	COMPOUND NAMES
Plumbous sulfide	= Lead sulfide
Pluracol polyol	= Polypropylene glycol
PNA	= 4-Nitroaniline
PNP	= 4-Nitrophenol
Poly-solv DB	= Diethylene glycol monobutyl ether
Poly-solv DE	= Diethylene glycol monoethyl ether
Poly-solv DM,	= Diethylene glycol monomethyl ether
Poly-solv EB	= Ethylene glycol monobutyl ether
Poly-solv EE acetate	= 2-Ethoxyethyl acetate
Poly-solv EE acetate	= Ethylene glycol monoethyl ether acetate
Poly-solv EE	= 2-Ethoxyethanol
Poly-solv EE	= Ethylene glycol monoethyl ether
Poly-solv EM	= Ethylene glycol monomethyl ether
Poly (oxyethyl) dodecyl ether	= Ethoxylated dodecanol
Poly (oxyethyl) lauryl ether	= Ethoxylated dodecanol
Poly (propylene glycol) methyl ether	= Polypropylene glycol methyl ether
Poly solv	= Diethylene glycol dimethyl ether
Poly(dimethylsiloxane)	= Dimethylpolysiloxane
Poly(ethyleneimine)	= Polyethylene polyamines
Poly(oxyethyl) myristyl ether	= Ethoxylated tetradecanol
Poly(oxyethyl) pentadecyl ether	= Ethoxylated pentadecanol
Poly(oxyethyl) tetradecyl ether	= Ethoxylated tetradecanol
Poly(oxyethyl) tridecyl ether	= Ethoxylated tridecanol
Polybutene	= Polybutene
Polychlorinated biphenyl	= Polychlorinated biphenyl
Polychloropolyphenyls	= Polychlorinated biphenyl
Polycizer 962-BPA	= Ditridecyl phthalate
Polyethylene polyamines	= Polyethylene polyamines
Polyethyleneimine	= Polyethylene polyamines
Polyformaldehyde	= Paraformaldehyde
Polyisobutylene plastics	= Polybutene
Polyisobutylene resins	= Polybutene
Polyisobutylene waxes	= Polybutene
Polymethylene polyphenyl isocyanate	= Polymethylene polyphenyl isocyanate
Polyoxpropylene glycol	= Polypropylene glycol
Polyoxymethylene glycol	= Paraformaldehyde
Polyoxymethylene	= Paraformaldehyde
Polyoxypropylene glycol methyl ether	= Polypropylene glycol methyl ether
Polyoxypropylene glycol	= Polypropylene glycol
Polyphosphoric acid	= Polyphosphoric acid
Polypropylene glycol methyl ether	= Polypropylene glycol methyl ether
Polypropylene glycol	= Polypropylene glycol
Polypropylene glycols P400 to P4000	= Polypropylene glycol
Polypropylene	= Polypropylene
Potash nitrate	= Potassium nitrate
Potash soap	= Potassium oleate
Potassium acid arsenate	= Potassium arsenate
Potassium acid oxalate	= Potassium binoxalate
Potassium antimonyl tartrate	= Antimony potassium tartrate
Potassium arsenate	= Potassium arsenate
Potassium arsenite	= Potassium arsenite
Potassium bichromate	= Potassium dichromate
Potassium binoxalate	= Potassium binoxalate
Potassium chlorate	= Potassium chlorate

SYNONYM	COMPOUND NAMES
Potassium chromate (VI)	= Potassium chromate
Potassium chromate	= Potassium chromate
Potassium cyanide	= Potassium cyanide
Potassium dichloro-s-triazinetriene	= Potassium dichloro-s-triazinetriene
Potassium dichloroisocyanurate	= Potassium dichloro-s-triazinetriene
Potassium dichromate	= Potassium dichromate
Potassium dihydrogen arsenate	= Potassium arsenate
Potassium fluozirconate	= Zirconium potassium flouride
Potassium hexafluorozirconate	= Zirconium potassium flouride
Potassium hydroxide solution	= Caustic potash solution
Potassium hydroxide	= Potassium hydroxide
Potassium iodide	= Potassium iodide
Potassium metaarsenite	= Potassium arsenite
Potassium nitrate	= Potassium nitrate
Potassium oleate	= Oleic acid, potassium salt
Potassium oleate	= Potassium oleate
Potassium oxalate monohydrate	= Potassium oxalate
Potassium oxalate	= Potassium oxalate
Potassium permanganate	= Potassium permanganate
Potassium peroxide	= Potassium peroxide
Potassium superoxide	= Potassium peroxide
Potassium zinc chromate	= Zinc potassium chromate
Potassium zirconium fluoride	= Zirconium potassium flouride
Potassium	= Potassium
Potato spirit oil	= Isoamyl alcohol
Potcrate	= Potassium chlorate
Preservative oil	= Oils, miscellaneous: penetrating
Primagram	= Metolachlor
Prime steam lard	= Oils, edible: lard
Primextra	= Metolachlor
Prodox 131	= o-Isopropyl phenol
Propadiene-methylacetylene mixture	= Methyl acetylene, propadiene mixture
Propanal	= Propionaldehyde
1-Propanamine, 2-methyl-N-(2-methyl propyl)-	= Diisobutylamine
Propane-1-thiol	= n-Propyl mercaptan
Propane-2-carboxylic acid	= Isobutyric acid
Propane-2-thiol	= Isopropyl mercaptan
Propane-butane-(propylene)	= Liquefied petroleum gas
Propane, 1-nitro-	= 1-Nitropropane
Propane, 1,2,3-trichloro	= 1,2,3-Trichloropropane
Propane, chloro-	= n-Propyl chloride
Propane, 1,1-dichloro-	= 1,1-Dichloropropane
Propane	= Propane
Propanecarboxylic acid	= n-Butyric acid
Propanedinitrile	= Propanedinitrile
1,2-Propanediol-1-acrylate	= Hydroxypropyl acrylate
1,2-Propanediol 1-methacrylate	= Hydroxypropyl methacrylate
1,3-Propanediol, 2,2-dimethyl	= 2,2-Dimethylpropane-1,3-diol
1,2-Propanediol	= Propylene glycol
Propanenitrile, 2-hydroxy-2-methyl	= Acetone cyanohydrin
Propanenitrile	= Propionitrile
2-Propanethiol	= Isopropyl mercaptan
1-Propanethiol	= n-Propyl mercaptan

SYNONYM	COMPOUND NAMES
1,2,3-Propanetriol	= Glycerine
Propanoic acid butyl ester	= n-Butyl propionate
Propanoic acid, 2-chloro-	= 2-Chloropropionic acid
Propanoic acid, 2,2-di-methyl-	= Trimethylacetic acid
Propanoic acid, ethyl ester	= Ethyl propionate
Propanoic acid	= Propionic acid
Propanoic anhydride	= Propionic anhydride
2-Propanol 1,1',1"-nitrilotri-	= Triisopropanolamine
1-Propanol, 2-amino-	= 2-Propanolamine
1-Propanol, 2-amino-2-methyl-	= 2-Amino-2-methyl-1-propanol (90% or less)
Propanol, 3-(3-(3-methoxypropoxy)propoxy)-	= Tripropylene glycol methyl ether
1-Propanol, 3-amino	= n-Propanolamine
2-Propanol	= Isopropyl alcohol
1-Propanol	= n-Propyl alcohol
2-Propanolamine	= 2-Propanolamine
n-Propanolamine	= n-Propanolamine
3-Propanolamine	= n-Propanolamine
Propanolide	= beta-Propiolactone
2-Propanone	= Acetone
Propanone	= Acetone
Propargil	= Propargite
Propargite	= Propargite
Propargyl alcohol	= Propargyl alcohol
2-Propen-1-ol	= Allyl alcohol
2-Propenal	= Acrolein
Propenamide (50%)	= Acrylamide solution
Propene polymer	= Polypropylene
1-Propene, 2-methyl trimer	= Triisobutylene
Propene, trimer	= Propylene trimer
Propene	= Propylene
2-Propenenitrile, 2-methyl	= Methacrylonitrile
Propeneoxide	= Propylene oxide
Propenionic acid, 2-Methylene	= Methacrylic acid
2-Propenoic acid, decyl ester	= n-Decyl acrylate
Propenoic acid	= Acrylic acid
beta-Propiolactone	= beta-Propiolactone
Propiolic alcohol	= Propargyl alcohol
Propionaldehyde	= Propionaldehyde
Propione	= Diethyl ketone
Propionic acid butyl ester	= n-Butyl propionate
Propionic acid, 2-chloro-	= 2-Chloropropionic acid
Propionic acid, 3-chloro-	= 3-Chloropropionic acid
Propionic acid, 3-ethoxyethyl ester	= Ethyl-3-ethoxypropionate
Propionic acid	= Propionic acid
Propionic aldehyde	= Propionaldehyde
Propionic anhydride	= Propionic anhydride
Propionic nitrile	= Propionitrile
Propionitrile	= Propionitrile
beta-Propionolactone	= beta-Propiolactone
Propionyl oxide	= Propionic anhydride
n-Propoxypropanol	= n-Propoxypropanol
N-Propyl-1-propanamine	= Di-n-propylamine

SYNONYM	COMPOUND NAMES
2-Propyl acetate	= Isopropyl acetate
n-Propyl acetate	= n-Propyl acetate
sec-Propyl alcohol	= Isopropyl alcohol
n-Propyl alcohol	= n-Propyl alcohol
Propyl alcohol	= n-Propyl alcohol
Propyl aldehyde	= Propionaldehyde
n-Propyl chloride	= n-Propyl chloride
Propyl cyanide	= Butyronitrile
n-Propyl ether	= n-Propyl ether
n-Propyl mercaptan	= n-Propyl mercaptan
n-Propyl nitrate	= n-Propyl nitrate
iso-Propylamine	= Isopropylamine
1-Propylamine	= n-Propylamine
n-Propylamine	= n-Propylamine
n-Propylbenzene	= n-Propylbenzene
Propylbromide	= 1-Bromopropane
n-Propylbromide	= 1-Bromopropane
n-Propylcarbinol	= n-Butyl alcohol
n-Propylcarbonyl chloride	= Butyl chloride
Propylene butylene polymer	= Propylene butylene polymer
Propylene dichloride	= 1,2-Dichloropropane
Propylene glycol ethyl ether	= Propylene glycol ethyl ether
Propylene glycol methyl ether acetate	= Propylene glycol methyl ether acetate
Propylene glycol methyl ether	= Propylene glycol methyl ether
Propylene glycol monoacrylate	= Hydroxypropyl acrylate
Propylene glycol monomethacrylate	= Hydroxypropyl methacrylate
Propylene glycol	= Propylene glycol
Propylene oxide	= Propylene oxide
Propylene tetramer	= Dodecene
Propylene tetramer	= Propylene tetramer
Propylene trimer	= Nonene
Propylene trimer	= Propylene trimer
Propylene	= Propylene
Propyleneimine	= Propyleneimine
Propylethylene	= 1-Pentene
Propylic aldehyde	= Propionaldehyde
Propylidene chloride	= 1,1-Dichloropropane
2-Propyn-1-ol	= Propargyl alcohol
1-Propyne-3-ol	= Propargyl alcohol
Propynyl alcohol	= Propargyl alcohol
Prussic acid	= Hydrogen cyanide
Pseudocumene	= 1,2,4-Trimethylbenzene
Pseudocumol	= 1,2,4-Trimethylbenzene
Pseudoheptyl alcohol	= Ethyl butanol
Pseudothiourea	= Thiocarbamide
Psicumene	= 1,2,4-Trimethylbenzene
Pyranol 1478	= 1,2,3-Trichlorobenzene
Pyrazine hexahydride	= Piperazine
Pyrethrins	= Pyrethrins
Pyrethrum flowers	= Pyrethrins
4-Pyridinamine	= 4-Aminopyridine
Pyridine, 3-methyl	= 3-Methylpyridine
Pyridine	= Pyridine
4-Pyridylamine	= 4-Aminopyridine



SYNONYM	COMPOUND NAMES
Pyrocatechin	= Catechol
Pyrocatechinic acid	= Catechol
Pyrofax	= Liquefied petroleum gas
Pyrogallic acid	= Pyrogallic acid
Pyrogallol	= Pyrogallic acid
Pyrogenetic acid	= Hydroquinone
Pyromucic aldehyde	= Furfural
Pyroxylic spirit	= Methyl alcohol
Pyroxylin solution	= Collodion
Quakeral	= Furfural
Quicklime	= Calcium oxide
Quicksilver	= Mercury
Quinol	= Hydroquinone
Quinoline	= Quinoline
Quinone	= p-Benzoquinone
R-124	= Monochlorotetrafluoroethane
R-21	= Dichloromonofluoromethane
Racemic lactic acid	= Lactic acid
Range oil	= Jet fuels: JP-1
Range oil	= Kerosene
Range oil	= Oils, fuel: no. 1
Raspite	= Lead tungstate
Ratox	= Thallium sulfate
Raw linseed oil	= Oils, miscellaneous: linseed
RC plasticizer DBP	= Dibutyl phthalate
RCRA waste number U152	= Methacrylonitrile
Realgar	= Arsenic disulfide
Red arsenic glass	= Arsenic disulfide
Red arsenic sulfide	= Arsenic disulfide
Red oil	= Oleic acid
Red orpiment	= Arsenic disulfide
Red oxide of nitrogen	= Nitrogen tetroxide
Red TR base	= 4-Chloro-o-toluidine
Refrigerant 114	= Dichlorotetrafluoroethane
Refrigerant 152A	= 1,1-Difluoroethane
Refrigerant 21	= Dichloromonofluoromethane
Regalon	= Diquat
Reglone	= Diquat
Regulox	= Maleic hydrazide
Reofos 95	= Trixylenyl phosphate
Residual asphalt	= Asphalt blending stocks: straight run residue
Residual fuel oil	= Oils, fuel: 4
Residual fuel oil	= Oils, fuel: 5
Residual fuel oil	= Oils, fuel: no. 6
Residual oil	= Asphalt blending stocks: roofers flux
Resin oil	= Oils, miscellaneous: rosin
Resorcin	= Resorcinol
Resorcinol	= Resorcinol
Retarder W	= Salicylic acid
Retinol	= Oils, miscellaneous: resin
Retinol	= Oils, miscellaneous: rosin
Rhodanate	= Sodium thiocyanate
Rhodanate	= Sodium thiocyanate solution (56% or

SYNONYM	COMPOUND NAMES
Road binder	= Asphalt blending stocks: straight run residue
Road oil	= Asphalt blending stocks: roofers flux
Rose ether	= Ethylene glycol phenyl ether
Rosin oil	= Oils, miscellaneous: resin
Rosinol	= Oils, miscellaneous: resin
Rosinol	= Oils, miscellaneous: rosin
Rubbing alcohol	= Isopropyl alcohol
Ruby arsenic	= Arsenic disulfide
Saccharose	= Sucrose
Saccharum	= Sucrose
Safflower oil	= Oils, edible: safflower
Safflower seed oil	= Oils, edible: safflower
Sal acetosella	= Potassium binoxalate
Sal ammoniac	= Ammonium chloride
Sal volatile	= Ammonium carbonate
Salicylal	= Salicylaldehyde
Salicylaldehyde	= Salicylaldehyde
Salicylic acid	= Salicylic acid
Salicylic aldehyde	= Salicylaldehyde
Salmiac	= Ammonium chloride
Salt of Saturn	= Lead acetate
Salt of sorrel	= Potassium binoxalate
Saltpeter	= Potassium nitrate
Salufer	= Sodium silicofluoride
Sand acid	= Fluosilicic acid
Santicizer 711	= Diundecyl phthalate
Santochlor	= p-Dichlorobenzene
Santophen 20	= Pentachlorophenol
Saralex	= Diazinon
Scheele's green	= Copper arsenite
Scheelite	= Lead tungstate
Schweinfurth green	= Copper acetoarsenite
SDMH	= 1,2-Dimethylhydrazine
Seal-coating material	= Asphalt blending stocks: straight run residue
Secondary ammonium phosphate	= Ammonium phosphate
Selenic anhydride	= Selenium trioxide
Selenious acid, disodium salt	= Sodium selenite
Selenious anhydride	= Selenium dioxide
Selenium dioxide	= Selenium dioxide
Selenium oxide	= Selenium dioxide
Selenium trioxide	= Selenium trioxide
Senarmontite	= Antimony trioxide
Sentry	= Calcium hypochlorite
Sevin	= Carbaryl
Sextone B	= Methylcyclohexane
Sextone	= Cyclohexanone
Shell charcoal	= Charcoal
Signal oil	= Oils, miscellaneous: mineral seal
Silibond	= Ethyl silicate
Silicochloroform	= Trichlorosilane
Silicofluoric acid	= Fluosilicic acid

SYNONYM	COMPOUND NAMES
Silicon chloride	= Silicon tetrachloride
Silicon tetrachloride	= Silicon tetrachloride
Silicone fluids	= Dimethylpolysiloxane
Silver acetate	= Silver acetate
Silver carbonate	= Silver carbonate
Silver fluoride	= Silver fluoride
Silver iodate	= Silver iodate
Silver monofluoride	= Silver fluoride
Silver nitrate	= Silver nitrate
Silver oxide	= Silver oxide
Silver sulfate	= Silver sulfate
Silvex, isooctyl ester	= Isooctyl ester
Silvex	= 2-(2,4,5-Trichlorophenoxy) propanoic acid
Silvisar 510	= Cacodylic acid
SKDN	= White spirit (low (15-20%) aromatic)
Slaked lime	= Calcium hydroxide
Slow curing asphalt	= Oils, miscellaneous: road
Smithsonite	= Zinc carbonate
Soap	= Ammonium stearate
Soda chloric acid, sodium salt	= Sodium chlorate solution
Soda niter	= Sodium nitrate
Sodamide	= Sodium amide
Sodium 2-benzothiazolethioate	= Sodium 2-mercaptobenzothiazol solution
Sodium 2-mercaptobenzothiazol solution	= Sodium 2-mercaptobenzothiazol solution
Sodium acid pyrophosphate	= Sodium phosphate
Sodium acid sulfite	= Sodium bisulfite
Sodium alkyl sulfates	= Sodium alkyl sulfates
Sodium alkylbenzenesulfonates	= Sodium alkylbenzenesulfonates
Sodium aluminate solution (45% or less)	= Sodium aluminate solution (45% or less)
Sodium amide	= Sodium amide
Sodium arsenate, dibasic	= Sodium arsenate
Sodium arsenate	= Sodium arsenate
Sodium arsenite	= Sodium arsenite
Sodium azide	= Sodium azide
Sodium baborate	= Sodium borate
Sodium bichromate	= Sodium dichromate
Sodium bifluoride	= Sodium bifluoride
Sodium bisulfide	= Sodium hydrosulfide solution
Sodium bisulfite solution	= Sodium hydrogen sulfite solution (35% or less)
Sodium bisulfite	= Sodium bisulfite
Sodium borate	= Sodium borate
Sodium borohydride	= Sodium borohydride
Sodium cacodylate	= Sodium cacodylate
Sodium cetyl sulfate solution	= Hexadecyl sulfate, sodium salt
Sodium chlorate solution	= Sodium chlorate solution
Sodium chlorate	= Sodium chlorate
Sodium chromate (VI)	= Sodium chromate
Sodium chromate	= Sodium chromate
Sodium cyanide	= Sodium cyanide
Sodium dichloro-s-triazinetriene	= Sodium dichloro-s-triazinetriene
Sodium dichloroisocyanurate	= Sodium dichloro-s-triazinetriene
Sodium dichromate	= Sodium dichromate

SYNONYM	COMPOUND NAMES
Sodium difluoride	= Sodium bifluoride
Sodium dimethylarsenate	= Sodium cacodylate
Sodium dodecyl sulfate	= Dodecyl sulfate, sodium salt
Sodium dodecylbenzene sulfonate	= Dodecyl benzene sulfonic acid, sodium salt
Sodium ferrocyanide	= Sodium ferrocyanide
Sodium fluoride	= Sodium fluoride
Sodium fluoroacetate	= Sodium fluoroacetate
Sodium fluosilicate	= Sodium silicofluoride
Sodium hexafluorosilicate	= Sodium silicofluoride
Sodium hydride	= Sodium hydride
Sodium hydrogen alkyl sulfate	= Sodium alkyl sulfates
Sodium hydrogen difluoride	= Sodium bifluoride
Sodium hydrogen fluoride	= Sodium bifluoride
Sodium hydrogen sulfide	= Sodium hydrosulfide solution
Sodium hydrogen sulfite solution (35% or less)	= Sodium hydrogen sulfite solution (35% or less)
Sodium hydrosulfide solution	= Sodium hydrosulfide solution
Sodium hydroxide solution	= Caustic soda solution
Sodium hydroxide solution	= Sodium hydroxide solution
Sodium hydroxide	= Sodium hydroxide
Sodium hypochlorite solution	= Sodium hypochlorite solution
Sodium hypochlorite	= Sodium hypochlorite
Sodium lauryl sulfate	= Dodecyl sulfate, sodium salt
Sodium meta arsenite	= Sodium arsenite
Sodium metabisulfite	= Sodium bisulfite
Sodium methoxide	= Sodium methylate
Sodium methylate	= Sodium methylate
Sodium monofluoroacetate	= Sodium fluoroacetate
Sodium nitrate	= Sodium nitrate
Sodium nitrite liquor	= Sodium nitrite solution
Sodium nitrite solution	= Sodium nitrite solution
Sodium nitrite	= Sodium nitrite
Sodium oleate	= Oleic acid, sodium salt
Sodium ortho arsenite	= Sodium arsenite
Sodium oxalate	= Sodium oxalate
Sodium pentachlorophenate	= Sodium pentachlorophenate
Sodium phosphate dibasic	= Sodium phosphate
Sodium phosphate, monobasic	= Sodium phosphate
Sodium phosphate, tribasic	= Sodium phosphate
Sodium phosphate, tribasic	= Sodium phosphate, tribasic
Sodium phosphate	= Sodium phosphate
Sodium pyroborate	= Sodium borate
Sodium pyrosulfite	= Sodium bisulfite
Sodium rhodanide	= Sodium thiocyanate
Sodium rhodanide	= Sodium thiocyanate solution (56% or less)
Sodium selenite	= Sodium selenite
Sodium silicate	= Sodium silicate
Sodium silicofluoride	= Sodium silicofluoride
Sodium sulfhydrate	= Sodium hydrosulfide solution
Sodium sulfide	= Sodium sulfide
Sodium sulfite	= Sodium sulfite
Sodium sulfocyanate	= Sodium thiocyanate

SYNONYM	COMPOUND NAMES
Sodium sulfocyanate	= Sodium thiocyanate solution (56% or less)
Sodium tetraborate, anhydrous	= Sodium borate
Sodium thiocyanate solution (56% or less)	= Sodium thiocyanate solution (56% or less)
Sodium thiocyanate	= Sodium thiocyanate
Sodium	= Sodium
Solar nitrogen solutions	= Ammonium nitrate-urea solution
Soluble glass	= Sodium silicate
Solvarone	= Dimethyl phthalate
Sorbit	= Sorbitol
Sorbitol	= Sorbitol
Sorbol	= Sorbitol
Soybean oil	= Oils, edible: soya bean
Spectracide	= Diazinon
Spirit of ether nitrite	= Ethyl nitrite
Spirit of turpentine	= Turpentine
Spotting naphtha	= Naphtha: stoddard solvent
Staflax DTD	= Ditridecyl phthalate
Stannous flouride	= Stannous flouride
Steam turbine lube oil	= Oils, miscellaneous: turbine
Steam turbine oil	= Oils, miscellaneous: turbine
Stearic acid, ammonium salt	= Ammonium stearate
Stearic acid, lead salt	= Lead stearate
Stearic acid	= Stearic acid
Stearophanic acid	= Stearic acid
Stearyl alcohol, crude	= Tallow fatty alcohol
Stearyl dimethylbenzyl ammonium chloride	= Benzyl dimethyloctadecyl ammonium chloride
Steinbuhl yellow	= Calcium chromate
Stolzite	= Lead tungstate
Straight run gasoline	= Distillates: straight run
Strontium chromate	= Strontium chromate
Strontium nitrate	= Strontium nitrate
Strontium yellow	= Strontium chromate
Strychnine	= Strychnine
Styralyl alcohol	= a-Methylbenzyl alcohol
Styrene	= Styrene
Styrol	= Styrene
Styrolene	= Styrene
Sucrose	= Sucrose
Sugar of lead	= Lead acetate
Sugar	= Sucrose
Sulfamic acid, cobalt salt	= Cobalt sulfamate
Sulfamic acid, monoammonium salt	= Ammonium sulfamate
Sulfate of copper	= Copper sulfate
Sulfate turpentine	= Turpentine
Sulfated neatsfoot oil	= Oils, miscellaneous: tanner's
Sulfolane-W	= Sulfolane
Sulfolane	= Sulfolane
Sulfonated alkylbenzene, sodium salt	= Sodium alkylbenzenesulfonates
Sulfotep	= Tetraethyl dithiopyrophosphate
Sulfur dioxide	= Sulfur dioxide
Sulfur monochloride	= Sulfur monochloride

SYNONYM	COMPOUND NAMES
Sulfur	= Sulfur
Sulfuretted hydrogen	= Hydrogen sulfide
Sulfuric acid, chromium (3#I+) salt (3-2)	= Chromic sulfate
Sulfuric acid, diethyl ester	= Diethyl sulfate
Sulfuric acid, spent	= Sulfuric acid, spent
Sulfuric acid, thallium salt	= Thallium sulfate
Sulfuric acid	= Sulfuric acid
Sulfuric chlorhydrin	= Chlorosulfonic acid
Sulfuryl chloride	= Sulfuryl chloride
Sulourea	= Thiocarbamide
Sulphuretted hydrogen	= Hydrogen sulfide
Superoxol	= Hydrogen peroxide
Swedish green	= Copper arsenite
Sweet birch oil	= Methyl salicylate
Sweet spirit of nitre	= Ethyl nitrite
Synthetic rubber latex	= Latex, liquid synthetic
Systox and isosystox mixture	= Demeton
2,4,5-T esters	= 2,4,5-T esters
2,4,5-T sodium salt	= 2,4,5-Trichlorophenoxyacetic acid, sodium salt
T.E.P.	= Tetraethyl pyrophosphate
T.E.P.P.	= Tetraethyl pyrophosphate
2,4,5-T	= 2,4,5-Trichlorophenoxyacetic acid
Tall oil fatty oil	= Tall oil, fatty acid
Tall oil, fatty acid	= Tall oil, fatty acid
Tallow benzyl dimethyl ammonium chloride	= Benzyldimethyloctadecylammonium chloride
Tallow fatty alcohol	= Tallow fatty alcohol
Tallow oil	= Tallow
Tallow	= Tallow
Tannic acid	= Tannic acid
Tannin	= Tannic acid
Tar acids	= Cresols
Tar camphor	= Naphthalene
Tartar emetic	= Antimony potassium tartrate
1-Tartaric acid, ammonium salt	= Ammonium tartrate
Tartaric acid, copper salt	= Copper tartrate
Tartarized antimony	= Antimony potassium tartrate
Tartrated antimony	= Antimony potassium tartrate
TBA	= tert-Butylamine
TBP	= Tributyl phosphate
TBT	= Butyl toluene
TCP	= Tricresyl phosphate (<1% ortho isomer)
TDE	= DDD
TDI	= Toluene 2,4-diisocyanate
TEA	= Triethylaluminum
Teaberry or wintergreen oil	= Methyl salicylate
Tear gas	= Chloroacetophenone
Teflon monomer	= Tetrafluoroethylene
TEG	= Triethylene glycol
TEL	= Tetraethyl lead
Telone	= 1,3-Dichloropropene
Telone	= Dichloropropene, dichloropropane mixture

SYNONYM	COMPOUND NAMES
TEN	= Triethylamine
TEP	= Triethyl phosphate
Terephthalic acid, dimethyl ester	= Dimethyl terephthalate
Tergitol nonionic 3-A-6	= Ethoxylated tridecanol
Tergitol nonionic 45-S-10	= Ethoxylated pentadecanol
Tergitol nonionic 45-S-10	= Ethoxylated tetradecanol
Tergitol nonionic TMN	= Ethoxylated dodecanol
Terpinene	= Dipentene
delta-1,8-Terpodiene	= Dipentene
TETA	= Triethylenetetramine
Tetan	= Tetranitromethane
Tetraammine copper sulfate	= Copper sulfate, ammoniated
3,6,9,12-Tetraazatetradecane-1,14-diamine	= Pentaethylenehexamine
Tetrabutyl titanate	= Tetrabutyl titanate
Tetracap	= Tetrachloroethylene
Tetrachloroethane	= Tetrachloroethane
1,1,2,2-Tetrachloroethane	= Tetrachloroethane
Tetrachloroethylene	= Tetrachloroethylene
Tetrachloromethane	= Carbon tetrachloride
Tetrachlorozirconium	= Zirconium tetrachloride
Tetradecanol	= Linear alcohols
1-Tetradecanol	= Tetradecanol
Tetradecanol	= Tetradecanol
1-Tetradecene	= 1-Tetradecene
n-Tetradecyl alcohol	= Tetradecanol
Tetradecylbenzene	= Tetradecylbenzene
Tetraethyl dithionopyrophosphate	= Tetraethyl dithiopyrophosphate
Tetraethyl dithiopyrophosphate	= Tetraethyl dithiopyrophosphate
Tetraethyl lead	= Tetraethyl lead
Tetraethyl orthosilicate	= Ethyl silicate
Tetraethyl pyrophosphate	= Tetraethyl pyrophosphate
Tetraethyl silicate	= Ethyl silicate
Tetraethylene glycol	= Tetraethylene glycol
Tetraethylenepentamine	= Tetraethylenepentamine
Tetrafluoroethylene	= Tetrafluoroethylene
Tetrahydro-2h-1, 4-oxazine	= Morpholine
3a,4,7,7a-Tetrahydro-4,7-Methanoindene	= Dicyclopentadiene
Tetrahydro-p-oxazine	= Morpholine
3a,4,7,7a-Tetrahydrodimethyl-4,7-methanoindene	= Methylcyclopentadiene dimer
Tetrahydrofuran	= Tetrahydrofuran
Tetrahydronaphthalene	= Tetrahydronaphthalene
1,2,3,4-Tetrahydronaphthalene	= Tetrahydronaphthalene
Tetrahydrothiophene-1,1-Dioxide	= Sulfolane
Tetrahydroxymethylmethane	= Pentaerythritol
Tetralin	= Tetrahydronaphthalene
Tetramethyl lead	= Tetramethyl lead
Tetramethyl thiuram disulfide	= Thiram
1,2,3,5-Tetramethylbenzene	= 1,2,3,5-Tetramethylbenzene
Tetramethylene glycol	= 1,4-Butanediol
Tetramethylene oxide	= Tetrahydrofuran
Tetramethylene sulfone	= Sulfolane
Tetramp	= Tetrahydronaphthalene

SYNONYM	COMPOUND NAMES
Tetranap	= Tetrahydronaphthalene
Tetranitromethane	= Tetranitromethane
Tetrapropylene	= Dodecene
Tetrapropylene	= Propylene tetramer
Tetrine acid	= Ethylenediamine tetracetic acid
Tetrole	= Furan
Tetron	= Tetraethyl pyrophosphate
Tetrosin LY	= Diphenyl
Texanol	= 1-Isobutyrate
Thallium (I) acetate	= Thallium acetate
Thallium (I) nitrate	= Thallium nitrate
Thallium acetate	= Thallium acetate
Thallium carbonate	= Thallium carbonate
Thallium monoacetate	= Thallium acetate
Thallium mononitrate	= Thallium nitrate
Thallium nitrate	= Thallium nitrate
Thallium sulfate	= Thallium sulfate
Thalious acetate	= Thallium acetate
Thalious carbonate	= Thallium carbonate
Thalious nitrate	= Thallium nitrate
Thalious sulfate	= Thallium sulfate
Thanol PPG	= Polypropylene glycol
THF	= Tetrahydrofuran
2-Thiapropene	= Dimethyl sulfide
Thiobutyl alcohol	= n-Butyl mercaptan
Thiocarbamide	= Thiocarbamide
Thiocarbonyl chloride	= Thiophosgene
Thiocarbonyl tetrachloride	= Perchloromethyl mercaptan
Thiocyanic acid, ammonium salt	= Ammonium thiocyanate
Thiodan	= Endosulfan
Thiodemeton	= Disulfoton
Thioethyl alcohol	= Ethyl mercaptan
Thiomethyl alcohol	= Methyl mercaptan
Thiophenol	= Benzenethiol
Thiophosgene	= Thiophosgene
Thiophosphoric anhydride	= Phosphorus pentasulfide
Thiosulfuric acid, lead salt	= Lead thiosulfate
Thiourea	= Thiocarbamide
2-Thiourea	= Thiocarbamide
Thiram	= Thiram
Thiuram	= Thiram
Thorium nitrate tetrahydrate	= Thorium nitrate
Thorium nitrate	= Thorium nitrate
TIBA	= Triisobutylaluminum
Tibal	= Triisobutylaluminum
Tin difluoride	= Stannous fluoride
Titanium butoxide	= Tetrabutyl titanate
Titanium tetrabutoxide	= Tetrabutyl titanate
Titanium tetrachloride	= Titanium tetrachloride
TMP	= Trimethyl phosphite
TNM	= Tetranitromethane
2,4-Tolamine	= Toluenediamine
Toluene 2,4-diisocyanate	= Toluene 2,4-diisocyanate
m-Toluene diamine	= Toluenediamine



SYNONYM	COMPOUND NAMES
Toluene, 2,6-dinitro-	= 2,6-Dinitrotoluene
Toluene, 3,4-dinitro-	= 3,4-Dinitrotoluene
Toluene, hexahydro	= Methylcyclohexane
Toluene, o-nitro	= o-Nitrotoluene
Toluene, p-nitro-	= p-Nitrotoluene
Toluene, p-tert-butyl	= Butyl toluene
Toluene	= Toluene
Toluenediamine	= Toluenediamine
2,4-Toluenediamine	= Toluenediamine
p-Toluenesulfonic acid	= p-Toluenesulfonic acid
m-Toluidine	= m-Toluidine
o-Toluidine	= o-Toluidine
p-Toluidine	= p-Toluidine
o-Toluol	= o-Cresol
p-Toluol	= p-Cresol
Toluol	= Toluene
meta-Toluylenediamine	= Toluenediamine
m-Tolyl chloride	= m-Chlorotoluene
o-Tolyl chloride	= o-Chlorotoluene
p-Tolyl chloride	= p-Chlorotoluene
Tolyl epoxypropyl ether	= Cresyl glycidyl ether
o-Tolyl fluoride	= 2-Fluorotoluene
m-Tolyl fluoride	= 3-Fluorotoluene
p-Tolyl fluoride	= 4-Fluorotoluene
Tolyl glycidyl ether	= Cresyl glycidyl ether
2,4-Tolylene diisocyanate	= Toluene 2,4-diisocyanate
4-m-Toluylenediamine	= Toluenediamine
o-Tolylphosphate phosphoric acid	= Tricresyl phosphate (>= 1% ortho isomer)
Tosic acid	= p-Toluenesulfonic acid
Toxaphene	= Toxaphene
Toxichlor	= Chlordane
Toxilic acid	= Maleic acid
Toxilic anhydride	= Maleic anhydride
2,4,5-TP acid esters	= Isooctyl ester
2,4,5-TP	= 2-(2,4,5-Trichlorophenoxy) propanoic acid
Transmission oil	= Oils, miscellaneous: lubricating
Transmission oil	= Oils, miscellaneous: motor
Treflan	= Trifluralin
Trethylene	= Trichloroethylene
Tri-6	= gamma-Benzene hexachloride
Tri-iso-propanolamine	= Triisopropanolamine
Tri-n-butyl phosphate	= Tributyl phosphate
Tri-n-propylamine	= Tripropylamine
Tri-o-cresyl ester	= Tricresyl phosphate (>= 1% ortho isomer)
Tri-p-cresyl phosphate	= Tricresyl phosphate (<1% ortho isomer)
Tri-p-tolyl phosphate	= Tricresyl phosphate (<1% ortho isomer)
Tributyl phosphate	= Tributyl phosphate
Tricalcium arsenate	= Calcium arsenate
Tricalcium ortho arsenate	= Calcium arsenate
Trichloran	= Trichloroethylene
Trichlorfon	= Trichlorfon

SYNONYM	COMPOUND NAMES
Trichlormethyl sulfur chloride	= Perchloromethyl mercaptan
1,1,2-Trichloro-1,2,2-trifluoroethane	= 1,1,2-Trichloro-1,2,2-trifluoroethane
1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane	= DDT
Trichloro-s-triazine-2,4,6-(1h, 3h, 5h)-trione	= Trichloro-s-triazinetriene
Trichloro-s-triazinetriene	= Trichloro-s-triazinetriene
Trichloroacetaldehyde	= Trichloroacetaldehyde
Trichloroamylsilane	= n-Amyltrichlorosilane
V-Trichlorobenzene	= 1,2,3-Trichlorobenzene
1,2,3-Trichlorobenzene	= 1,2,3-Trichlorobenzene
Vic-Trichlorobenzene	= 1,2,3-Trichlorobenzene
1,2,4-Trichlorobenzene	= 1,2,4-Trichlorobenzene
unsym-Trichlorobenzene	= 1,2,4-Trichlorobenzene
1,2,4-Trichlorobenzol	= 1,2,4-Trichlorobenzene
1,1,2-Trichloroethane	= 1,1,2-Trichloroethane
1,1,1-Trichloroethane	= Trichloroethane
Trichloroethane	= Trichloroethane
Trichloroethyl silane	= Ethyltrichlorosilane
Trichloroethyl silicone	= Ethyltrichlorosilane
Trichloroethylene	= Trichloroethylene
Trichloroethylene	= Trichloroethylene
Trichlorofluoromethane	= Trichlorofluoromethane
Trichlorohydrin	= 1,2,3-Trichloropropane
Trichloroiminoisocyanuric acid	= Trichloro-s-triazinetriene
Trichloroisocyanuric acid	= Trichloro-s-triazinetriene
Trichloromethane sulfuryl chloride	= Perchloromethyl mercaptan
Trichloromethane	= Chloroform
Trichloromethanesulfenyl chloride	= Perchloromethyl mercaptan
Trichloromethyl sulfochloride	= Perchloromethyl mercaptan
N-[(Trichloromethyl)thio]-4-cyclohexene-1,2,-dicarbodimide	= Captan
Trichloromethylsilane	= Methyltrichlorosilane
Trichloromonosilane	= Trichlorosilane
Trichloronitromethane	= Chloropicrin
Trichlorooxovanadium	= Vanadium oxytrichloride
Trichloropentylsilane	= n-Amyltrichlorosilane
2,4,5-Trichlorophenol	= Trichlorophenol
Trichlorophenol	= Trichlorophenol
2-(2,4,5-Trichlorophenoxy) propanoic acid	= 2-(2,4,5-Trichlorophenoxy) propanoic acid
2,4,5-Trichlorophenoxyacetic acid, sodium salt	= 2,4,5-Trichlorophenoxyacetic acid, sodium salt
2,4,5-Trichlorophenoxyacetic acid	= 2,4,5-Trichlorophenoxyacetic acid
1,2,3-Trichloropropane	= 1,2,3-Trichloropropane
Trichlorosilane	= Trichlorosilane
Trichlorotriazinetriene	= Trichloro-s-triazinetriene
1,1,2-Trichlorotrifluoroethane	= 1,1,2-Trichloro-1,2,2-trifluoroethane
Trichlorovinyl silicane	= Vinyltrichlorosilane
Trichlorovinylsilane	= Vinyltrichlorosilane
Triclene; algylen	= Trichloroethylene
Tricresyl phosphate (<1% ortho isomer)	= Tricresyl phosphate (<1% ortho isomer)
Tricresyl phosphate (>)	= 1% ortho isomer)=Tricresyl phosphate (>= 1% ortho isomer)

SYNONYM	COMPOUND NAMES
n-Tridecane	= Tridecane
Tridecane	= Tridecane
1-Tridecanol, phthalate	= Ditridecyl phthalate
Tridecanol	= Linear alcohols
Tridecanol	= Tridecanol
1-Tridecanol	= Tridecanol
1-Tridecene	= 1-Tridecene
Tridecylbenzene	= Tridecylbenzene
Tridimethylphenyl phosphate	= Trixylenyl phosphate
Trien	= Triethylenetetramine
Triethanolamine	= Dodecylbenzenesulfonic acid, triethanolamine salt
dodeceylbenzenesulfonate	= Dodecyl sulfate, triethanolamine salt
Triethanolamine lauryl sulfate	= Triethanolamine
Triethanolamine	= Triethyl phosphate
Triethyl phosphate	= Triethyl phosphite
Triethyl phosphite	= Triethylaluminum
Triethylaluminum	= Triethylamine
Triethylamine	= Triethylbenzene
Triethylbenzene	= Triethylbenzene
1,3,5-Triethylbenzene	= Triethylbenzene
sym-Triethylbenzene	= Triethylbenzene
Triethylene glycol di-(2-ethylbutyrate)	= Triethylene glycol di-(2-ethylbutyrate)
Triethylene glycol ethyl ether	= Triethylene glycol ethyl ether
Triethylene glycol methyl ether	= Triethylene glycol methyl ether
Triethylene glycol monoethyl ether	= Ethoxy triglycol
Triethylene glycol monoethyl ether	= Triethylene glycol ethyl ether
Triethylene glycol monomethyl ether	= Triethylene glycol methyl ether
Triethylene glycol	= Triethylene glycol
Triethylenephosphoramidate	= Tris(Aziridinyl)phosphine oxide
Triethylenetetramine	= Triethylenetetramine
Triethylolamine	= Triethanolamine
Trifluorochloroethylene	= Trifluorochloroethylene
Trifluorochloromethane	= Monochlorotrifluoromethane
Trifluoromethyl chloride	= Monochlorotrifluoromethane
Trifluoromonochloroethylene	= Trifluorochloroethylene
Trifluorovinyl chloride	= Trifluorochloroethylene
Trifluralin	= Trifluralin
Triglycine	= Nitrotriacetic acid and salts
Triglycol dicaproate	= Triethylene glycol di-(2-ethylbutyrate)
Triglycol dihexoate	= Triethylene glycol di-(2-ethylbutyrate)
Triglycol methyl ether	= Triethylene glycol methyl ether
Triglycol monoethyl ether	= Ethoxy triglycol
Triglycol monoethyl ether	= Triethylene glycol ethyl ether
Triglycol	= Triethylene glycol
1,2,3-Trihydroxybenzene	= Pyrogalllic acid
3,4,5-Trihydroxybenzoic acid	= Gallic acid
1,2,3-Trihydroxypropane	= Glycerine
Trihydroxytriethylamine	= Triethanolamine
Triisobutene	= Triisobutylene
Triisobutylaluminum	= Triisobutylaluminum
Triisobutylene	= Triisobutylene
Triisopropanolamine	= Triisopropanolamine
Trilene	= Trichloroethylene
2,4,4-Trimethyl-1-pentene	= Diisobutylene

SYNONYM	COMPOUND NAMES
2,4,6-Trimethyl-1,3,5-trioxane	= Paraldehyde
3,5,5-Trimethyl-2-cyclohexane-1-one	= Isophorone
4,7,7-Trimethyl-3-norcarene	= Carene
Trimethyl ester	= Trimethyl phosphite
Trimethyl hexamethylene diamine	= Trimethyl hexamethylene diamine
Trimethyl phosphite	= Trimethyl phosphite
Trimethylacetic acid	= Trimethylacetic acid
Trimethylamine	= Trimethylamine
Trimethylaminomethane	= tert-Butylamine
Asymmetrical Trimethylbenzene	= 1,2,4-Trimethylbenzene
1,2,4-Trimethylbenzene	= 1,2,4-Trimethylbenzene
Trimethylbenzylammonium chloride	= Benzyltrimethylammonium chloride
2,6,6-Trimethylbicyclo [3.1.1]hept-2-ene, 9cl	= Pinene
3,7,7-Trimethylbicyclo[0, 1, 4]hept-3-ene	= Carene
Trimethylcarbinol	= tert-Butyl alcohol
Trimethylchlorosilane	= Trimethylchlorosilane
Trimethylene chloride	= 1,3-Dichloropropane
Trimethylene dichloride	= 1,3-Dichloropropane
Trimethylene	= Cyclopropane
Trimethylheptanals	= Isodecaldehyde
Trimethylhexamethylene diisocyanate	= Trimethylhexamethylene diisocyanate
Trimethylsilyl chloride	= Trimethylchlorosilane
5,8,11-Trioxapentadecane	= Diethylene glycol dibutyl ether
3,6,9-Trioxaundecan-1, 11-diol	= Tetraethylene glycol
Tripropylamine	= Tripropylamine
Tripropylene glycol methyl ether	= Tripropylene glycol methyl ether
Tripropylene glycol	= Tripropylene glycol
Tripropylene	= Nonene
Tripropylene	= Propylene trimer
Trisodium nitrilotriacetate	= Nitrilotriacetic acid and salts
Trisodium orthophosphate	= Sodium phosphate, tribasic
Trisodium phosphate	= Sodium phosphate, tribasic
Trixylenyl phosphate	= Trixylenyl phosphate
Trixylyl phosphate	= Trixylenyl phosphate
p-TSA	= p-Toluenesulfonic acid
Tubercuprose	= Copper formate
Tucum oil	= Oils, edible: tucum
Turbine oil	= Oils, miscellaneous: turbine
Turpentine	= Turpentine
Turps	= Turpentine
Tyranton	= Diacetone alcohol
Ucane alkylate 12	= Dodecylbenzene
Ucar bisphenol HP	= Bisphenol A
Ucar solvent 2IM	= Dipropylene glycol methyl ether
Ucon 11	= Trichlorofluoromethane
Ucon 12	= Dichlorodifluoromethane
Uconn-22	= Chlorodifluoromethane
UDMH	= 1,1-Dimethylhydrazine
UF oxylignin	= Vanillin black liquor
UN 1272 (DOT)	= Oil, misc: pine
UN 2057 (DOT)	= Propylene trimer
UN 2243 (DOT)	= Cyclohexyl acetate
UN 2271 (DOTt)	= Ethyl amyl ketone

SYNONYM	COMPOUND NAMES
UN 2296 (DOT)	= Methylcyclohexane
UN 2323 (DOT)	= Triethyl phosphite
UN 2324 (DOT)	= Triisobutylene
UN 2364 (DOT)	= n-Propylbenzene
UN 2708 (DOT)	= 3-Methoxybutyl acetate
Un; do; tri; tetra; penta; or Hexa benzenesulfonic acid	= Alkyl(C <sub>11</sub> - C <sub>17</sub> )benzenesulfonic acid
UN2241 (DOT)	= Cycloheptane
UN2246 (DOT)	= Cyclopentene
UN2313 (DOT)	= 3-Methylpyridine
UN2313 (DOT)	= 4-Methylpyridine
n-Undecanoic acid	= Undecanoic acid
Undecanoic acid	= Undecanoic acid
Undecanol	= Undecanol
1-Undecanol	= Undecanol
1-Undecene	= 1-Undecene
n-Undecoic acid	= Undecanoic acid
Undecyl alcohol	= Undecanol
n-Undecylbenzene	= n-Undecylbenzene
Undecylethylene	= 1-Tridecene
n-Undecylic acid	= Undecanoic acid
Unipine	= Oil, misc: pine
Unslaked lime	= Calcium oxide
Uran, rustica	= Urea, ammonium nitrate soln (w/aqua ammonia)
Uranium acetate dihydrate	= Uranyl acetate
Uranium acetate	= Uranyl acetate
Uranium nitrate	= Uranyl nitrate
Uranium oxide (UO#m4)	= Uranium peroxide
Uranium oxide peroxide (UO#m2[O#m2])	= Uranium peroxide
Uranium oxyacetate dihydrate	= Uranyl acetate
Uranium peroxide	= Uranium peroxide
Uranium sulfate trihydrate	= Uranyl sulfate
Uranium sulfate	= Uranyl sulfate
Uranyl acetate dihydrate	= Uranyl acetate
Uranyl acetate	= Uranyl acetate
Uranyl nitrate	= Uranyl nitrate
Uranyl sulfate trihydrate	= Uranyl sulfate
Uranyl sulfate	= Uranyl sulfate
Urea hydrogen peroxide	= Urea peroxide
Urea peroxide	= Urea peroxide
Urea, ammonium nitrate soln (w/aqua ammonia)	= Urea, ammonium nitrate soln (w/aqua ammonia)
Urea, hydrogen peroxide salt	= Urea peroxide
Urea, thio-	= Thiocarbamide
Urea	= Urea
Urotropin	= Hexamethylenetetramine
USAF DO-45	= Acetal
USAF DO-46	= N-Aminoethyl piperazine
USAF ST40	= Methacrylonitrile
Valentinite	= Antimony trioxide
Valeral	= Valeraldehyde
n-Valeraldehyde	= n-Valeraldehyde
Valeraldehyde	= Valeraldehyde

SYNONYM	COMPOUND NAMES
Valeric acid	= Pentanoic acid
Valeric aldehyde	= n-Valeraldehyde
Valeric aldehyde	= Valeraldehyde
VAM	= Vinyl acetate
Vanadic anhydride	= Vanadium pentoxide
Vanadium oxide	= Vanadium oxide
Vanadium oxysulfate	= Vanadyl sulfate
Vanadium oxytrichloride	= Vanadium oxytrichloride
Vanadium pentaoxide	= Vanadium pentoxide
Vanadium pentoxide	= Vanadium oxide
Vanadium pentoxide	= Vanadium pentoxide
Vanadium(V) oxide	= Vanadium oxide
Vanadyl chloride	= Vanadium oxytrichloride
Vanadyl sulfate dihydrate	= Vanadyl sulfate
Vanadyl sulfate	= Vanadyl sulfate
Vanadyl trichloride	= Vanadium oxytrichloride
Vanicide	= Captan
Vanillan black liquor	= Vanillan black liquor
Vapona	= Dichlorvos
Vapotone	= Tetraethyl pyrophosphate
Vaseline	= Petrolatum
VCL	= Vinyl chloride
VCM	= Vinyl chloride
Vegetable carbon	= Charcoal
Velsicol 1068	= Chlordane
Velsicol	= Heptachlor
Ventox	= Acrylonitrile
Vermilion	= Mercuric sulfide
Versene acid	= Ethylenediamine tetracetic acid
Vidden D	= Dichloropropene, dichloropropane mixture
Vienna green	= Copper acetoarsenite
Vilrathane 4300	= Diphenylmethane diisocyanate
Vinamar	= Vinyl ethyl ether
Vinegar acid	= Acetic acid
Vinegar naphtha	= Ethyl acetate
4-Vinyl-1-cyclohexene	= Vinylcyclohexene
Vinyl A monomer	= Vinyl acetate
Vinyl acetate	= Vinyl acetate
Vinyl C monomer	= Vinyl chloride
Vinyl carbinol	= Allyl alcohol
Vinyl chloride	= Vinyl chloride
Vinyl cyanide	= Acrylonitrile
Vinyl ethyl ether	= Vinyl ethyl ether
Vinyl fluoride	= Vinyl fluoride
Vinyl formic acid	= Acrylic acid
Vinyl methyl ether	= Vinyl methyl ether
Vinyl neodecanoate	= Vinyl neodecanoate
Vinyl toluene	= Vinyl toluene
Vinyl trichloride	= 1,1,2-Trichloroethane
Vinylbenzene	= Styrene
Vinylcyclohexene	= Vinylcyclohexene
Vinylethylene	= Butadiene
Vinylidene chloride	= Vinylidene chloride

SYNONYM	COMPOUND NAMES
Vinylsilicon trichloride	= Vinyltrichlorosilane
Vinyltrichlorosilane	= Vinyltrichlorosilane
Vulkacit HX	= N-Ethylcyclohexylamine
VV 10 vinyl monomer	= Vinyl neodecanoate
Vyac	= Vinyl acetate
W-10	= Ethylene dibromide
W-15	= Ethylene dibromide
W-40	= Ethylene dibromide
Water displacing oil	= Oils, miscellaneous: penetrating
Water glass	= Sodium silicate
Waxes: carnauba	= Waxes: carnauba
Waxes: paraffin	= Waxes: paraffin
Weisspiessglanz	= Antimony trioxide
White arsenic	= Arsenic trioxide
White oil	= Oils, miscellaneous: mineral
White spirit (low (15-20%) aromatic)	= White spirit (low (15-20%) aromatic)
White vitriol	= Zinc sulfate
Witicizer 300	= Dibutyl phthalate
Wolfatox	= Methyl parathion
Wood alcohol	= Methyl alcohol
Wood charcoal	= Charcoal
Wood ether	= Dimethyl ether
Wood spirit	= Methyl alcohol
Wood turpentine	= Turpentine
Xenene	= Diphenyl
m-Xylene	= m-Xylene
o-Xylene	= o-Xylene
p-Xylene	= p-Xylene
Xylenol, phosphate (3:1)	= Trixylenyl phosphate
Xylenol	= Xylenol
2,6-Xylenol	= Xylenol
o-Xylidine	= 2,6-Dimethylaniline
2,6-Xylidine	= 2,6-Dimethylaniline
Xylol	= m-Xylene
Xylol	= o-Xylene
Xylol	= p-Xylene
Xylyl phosphate	= Trixylenyl phosphate
2,6-Xylylamine	= 2,6-Dimethylaniline
Yarmor pine oil	= Oil, misc: pine
Yarmor	= Oil, misc: pine
Yellow arsenic sulfide	= Arsenic trisulfide
Yellow petrolatum	= Petrolatum
Yellow phosphorus	= Phosphorus, white
Zactran	= Zectran
Zectane	= Zectran
Zectran	= Zectran
Zelio	= Thallium sulfate
Zextran	= Zectran
Zinc acetate dihydrate	= Zinc acetate
Zinc acetate	= Zinc acetate
Zinc ammonium chloride	= Zinc ammonium chloride
Zinc arsenate	= Zinc arsenate
Zinc bichromate	= Zinc bichromate
Zinc borate	= Zinc borate

SYNONYM	COMPOUND NAMES
Zinc bromide	= Zinc bromide
Zinc carbonate	= Zinc carbonate
Zinc chloride	= Zinc chloride
Zinc chromate (VI) hydroxide	= Zinc chromate
Zinc chromate	= Zinc chromate
Zinc cyanide	= Zinc cyanide
Zinc diacetate	= Zinc acetate
Zinc dialkyldithiophosphate	= Zinc dialkyldithiophosphate
Zinc dichromate	= Zinc bichromate
Zinc dicyanide	= Zinc cyanide
Zinc diethyl	= Diethylzinc
Zinc difluoride	= Zinc fluoride
Zinc dihexyldithiophosphate	= Zinc dialkyldithiophosphate
Zinc dihexylphosphorodithioate	= Zinc dialkyldithiophosphate
Zinc dimethyl	= Dimethylzinc
Zinc dithionite	= Zinc hydrosulfite
Zinc ethyl	= Diethylzinc
Zinc ethylenediaminetetraacetate	= Diammonium salt of zinc EDTA
Zinc fluoborate solution	= Zinc fluoroborate
Zinc fluoride	= Zinc fluoride
Zinc fluoroborate	= Zinc fluoroborate
Zinc fluosilicate	= Zinc silicofluoride
Zinc formate	= Zinc formate
Zinc hexafluorosilicate	= Zinc silicofluoride
Zinc hydrosulfite	= Zinc hydrosulfite
Zinc methyl	= Dimethylzinc
Zinc nitrate hexahydrate	= Zinc nitrate
Zinc nitrate	= Zinc nitrate
Zinc O,O-di-n-butylphosphorodithioate	= Zinc dialkyldithiophosphate
Zinc p-phenolsulfonate	= Zinc phenolsulfonate
Zinc phenolsulfonate octahydrate	= Zinc phenolsulfonate
Zinc phenolsulfonate	= Zinc phenolsulfonate
Zinc phosphide	= Zinc phosphide
Zinc potassium chromate	= Zinc potassium chromate
Zinc silicofluoride hexahydrate	= Zinc silicofluoride
Zinc silicofluoride	= Zinc silicofluoride
Zinc suflate heptahydrate	= Zinc sulfate
Zinc sulfate	= Zinc sulfate
Zinc sulfocarbonate	= Zinc phenolsulfonate
Zinc sulfophenate	= Zinc phenolsulfonate
Zinc vitriol	= Zinc sulfate
Zinc yellow Y-539-D	= Zinc potassium chromate
Zinc yellow	= Zinc chromate
Zirconium acetate solution	= Zirconium acetate
Zirconium acetate	= Zirconium acetate
Zirconium chloride	= Zirconium tetrachloride
Zirconium nitrate pentahydrate	= Zirconium nitrate
Zirconium nitrate	= Zirconium nitrate
Zirconium oxide chloride	= Zirconium oxychloride
Zirconium oxychloride hydrate	= Zirconium oxychloride
Zirconium oxychloride	= Zirconium oxychloride
Zirconium potassium flouride	= Zirconium potassium flouride
Zirconium sulfate tetrahydrate	= Zirconium sulfate
Zirconium sulfate	= Zirconium sulfate



SYNONYM	COMPOUND NAMES
Zirconium tetrachloride solid (DOT)	= Zirconium tetrachloride
Zirconium tetrachloride	= Zirconium tetrachloride
Zirconyl chloride	= Zirconium oxychloride

## 9. INDEX OF CODES

AAC	Acetic acid	AMH	Ammonium hydroxide (<28% aqueous ammonia)
AAD	Acetaldehyde	AMK	n-Amyl methyl ketone
AAM	Acrylamide solution	AMM	n-Amyl mercaptan
AAN	n-Amyl alcohol	AMN	Ammonium nitrate
AAS	sec-Amyl acetate	AMP	Ammonium perchlorate
AAT	Ammonium acetate	AMR	Ammonium stearate
ABC	Ammonium bicarbonate	AMS	Ammonium sulfate
ABF	Ammonium bifluoride	AMT	Ammonium thiocyanate
ABM	Acetyl bromide	AMY	n-Amyl chloride
ABN	Alkyl (C <sub>11</sub> – C <sub>17</sub> ) benzenesulfonic acid	ANB	Ammonium bromide
ABR	Allyl bromide	ANI	iso-Amyl nitrite
ABZ	Ammonium benzoate	ANL	Aniline
ACA	Acetic anhydride	ANP	Ammonium nitrate-phosphate mixture
ACB	Ammonium carbonate	ANS	Ammonium nitrate-sulfate mixture
ACC	Acetyl chloride	ANT	n-Amyl nitrate
ACD	Acridine	ANU	Ammonium nitrate-urea solution
ACE	Acetylene	AOL	Ammonium oleate
ACF	Allyl chloroformate	AOX	Ammonium oxalate
ACH	Ammonium chromate	APB	Ammonium pentaborate
ACI	Ammonium citrate, dibasic	APC	Antimony pentachloride
ACL	Aluminum chloride	APE	Ammonium persulfate
ACM	Ammonium carbamate	APF	Antimony pentafluoride
ACN	Acrylonitrile	APH	Aluminum phosphide
ACO	Aluminum chloride solution	API	Ammonium picrate, wet
ACP	Acetophenone	APO	Arsenic pentaoxide
ACR	Acrylic acid	APP	Ammonium phosphate
ACT	Acetone	APR	2-Amino-2-methyl-1-propanol (90% or less)
ACY	Acetone cyanohydrin	APS	Acetyl peroxide solution
ADA	Adipic acid	APT	Antimony potassium tartrate
ADN	Adiponitrile	APY	4-Aminopyridine
AEC	Amyl acetate (all isomers)	ARD	Arsenic disulfide
AEE	Aminoethylethanolamine	ARF	Asphalt blending stocks: roofers flux
AEL	Acetal	ARL	Acrolein
AEP	N-Aminoethyl piperazine	ART	Arsenic trisulfide
AFB	Ammonium fluoborate	ARX	Arsenic
AFM	Ammonium formate	ASA	Arsenic acid
AFR	Ammonium fluoride	ASC	Anisoyl chloride
AGC	Ammonium gluconate	ASF	Ammonium sulfide
AHP	Ammonium hypophosphite	ASL	Ammonium silicofluoride
AID	Ammonium iodide	ASM	Ammonium sulfamate
ALA	Allyl alcohol	ASP	Asphalt
ALC	Allyl chloride	ASR	Asphalt blending stocks: straight run residue
ALD	Aldrin	AST	Arsenic trichloride
ALF	Aluminum fluoride	ASU	Ammonium bisulfite
ALM	Aluminum sulfate	ASX	Aluminum sulfate solution
ALN	Aluminum nitrate	ATA	Acetylacetone
ALS	Ammonium lauryl sulfate	ATB	Antimony tribromide
ALT	Ammonium lactate	ATC	Allyltrichlorosilane
AMA	Ammonia, anhydrous	ATF	Ammonium thiosulfate
AMB	Ammonium molybdate	ATH	Anthracene
AMC	Ammonium chloride		
AMD	Ammonium dichromate		
AMF	Ammonium sulfite		

ATL	Amyl phthalate	BNZ	Benzene
ATM	Antimony trichloride	BOC	Bismuth oxychloride
ATN	Acetonitrile	BPA	Bisphenol A
ATO	Arsenic trioxide	BPC	Barium perchlorate
ATR	Ammonium tartrate	BPD	Benzene phosphorus dichloride
ATS	n-Amyltrichlorosilane	BPE	2-Bromopentane
ATT	Antimony trifluoride	BPF	Bromine pentafluoride
ATV	Ammonium thiosulfate solution (60% or less)	BPH	Butyl benzyl phthalate
ATX	Antimony trioxide	BPM	Barium permanganate
ATZ	Atrazine	BPB	n-Butyl propionate
AYA	tert-Amyl acetate	BPO	Barium peroxide
AZM	Azinphos methyl	BPR	1-Bromopropane
BAB	Bromoacetyl bromide	BPT	Benzene phosphorus thiodichloride
BAC	Boric acid	BRA	n-Butyric acid
BAD	iso-Butyraldehyde	BRC	Barium carbonate
BAI	iso-Butyl acrylate	BRE	Bromoacetone
BAL	Benzyl alcohol	BRO	Bromoform
BAM	n-Butylamine	BRT	Boron trichloride
BAN	n-Butyl alcohol	BRU	Brucine
BAS	sec-Butyl alcohol	BRX	Bromine
BAT	tert-Butyl alcohol	BSC	Benzenesulfonyl chloride
BBR	Benzyl bromide	BTA	sec-Butyl acetate
BBT	2-Bromobutane	BTB	Boron tribromide
BBU	1-Bromobutane	BTC	n-butyl acrylate
BBZ	Bromobenzene	BTD	1,4-Butynediol
BCF	Benzyl chloroformate	BTF	Bromine trifluoride
BCL	Benzyl chloride	BTL	sec-Butylamine
BCN	n-Butyl acetate	BTM	n-Butyl mercaptan
BCP	Boiler compound, liquid	BTN	Butylene
BCR	Barium chlorate	BTO	1,2-Butylene oxide
BCS	Butyltrichlorosilane	BTP	p-tert-Butylphenol
BCY	Barium cyanide	BTR	n-Butyraldehyde
BDE	Bisphenol a diglycidyl ether	BUA	tert-Butylamine
BDI	Butadiene	BUB	Butyl butyrate
BDM	Benzyl dimethylamine	BUC	Butyryl chloride
BDO	1,4-Butanediol	BUD	1,4-Butenediol
BEC	Beryllium chloride	BUE	Butyl toluene
BEF	Beryllium fluoride	BUF	n-Valeraldehyde
BEM	Beryllium	BUG	Butylene glycol
BEN	Beryllium nitrate	BUT	Butane
BEO	Beryllium oxide	BYA	tert-Butyl acetate
BES	Beryllium sulfate	BYC	Butyl chloride
BFN	n-Butyl formate	BZA	Benzoic acid
BFO	n-Butyl chloroformate	BZC	Benzoyl chloride
BGE	n-Butyl glycidyl ether	BZD	Benzaldehyde
BHC	gamma Benzene hexachloride	BZE	Benzyl acetate
BHP	tert-Butyl hydroperoxide	BZI	Benzidine
BIB	Isobutyl isobutyrate	BZL	Benzal chloride
BLE	Butyl lactate	BZM	Benzylamine
BMA	Benzyltrimethylammonium chloride	BZN	Benzonitrile
BMI	Isobutyl methacrylate	BZO	Benzyltrimethyloctadecylammonium chloride
BMN	n-butyl methacrylate	BZP	Benzophenone
BNI	Butyronitrile	BZQ	p-Benzoquinone
BNP	2-Butanone peroxide	BZT	Benzenethiol
BNT	Barium nitrate	CAA	Copper acetoarsenite

CAC	Chloroacetyl chloride	CLP	3-Chloropropionic acid
CAF	Calcium fluoride	CLS	Caprolactam
CAH	Calcium hydroxide	CLT	Copper lactate
CAL	Calcium phosphate	CLX	Chlorine
CAM	Calcium	CMA	Chromic anhydride
CAO	Calcium oxide	CMB	Cadmium bromide
CAP	p-Chloroaniline	CMC	Chromyl chloride
CAR	Carene	CME	Chloromethyl methyl ether
CAS	Calcium arsenite	CMH	Cumene hydroperoxide
CAT	Cadmium acetate	CMN	Cadmium nitrate
CBA	Cobalt acetate	CMO	Carbon monoxide
CBB	Carbon disulfide	CMP	p-Cymene
CBC	Cobalt chloride	CMS	Cadmium sulfate
CBD	Copper bromide (ous)	CNE	1-Chloro-1-nitropropane
CBF	Carbofuran	CNI	Copper nitrate
CBN	4-Chlorobutyronitrile	CNN	Copper naphthenate
CBO	Carbolic oil (mixture)	CNO	o-Chloronitrobenzene
CBR	Cyanogen bromide	CNT	Calcium nitrate
CBS	Cobalt sulfate	COB	Cobalt bromide (ous)
CBT	Carbon tetrachloride	COF	Cobalt fluoride
CBY	Carbaryl	COL	Copper oxalate
CCA	Calcium arsenate	COP	Copper acetate
CCB	Calcium carbide	COS	Cobalt sulfamate
CCC	Calcium chlorate	COU	Coumaphos
CCH	Cyclohexanone	COX	Cadmium oxide
CCL	Cyanogen chloride	CPA	Copper arsenite
CCN	Calcium cyanide	CPB	Copper bromide
CCO	Cobalt nitrate	CPC	Copper chloride
CCP	Calcium peroxide	CPE	Cyclopentene
CCR	Calcium chromate	CPF	Copper fluoroborate
CCT	Creosote, coal tar	CPG	Copper glycinate
CCY	Copper cyanide (ous)	CPH	Camphene
CDA	Cacodylic acid	CPL	Chloropicrin
CDC	Cadmium chloride	CPN	p-Chlorophenol
CDN	Chlordane	CPO	Camphor oil
CDO	Carbon dioxide	CPP	Calcium phosphide
CES	Cupriethylenediamine solution	CPR	Cyclopropane
CFB	Cadmium fluoroborate	CPS	Caustic potash solution
CFM	Cobalt formate	CPT	Captan
CGE	Cresyl glycidyl ether	CRA	Chloroacetophenone
CHA	Cyclohexylamine	CRB	Chlorobenzene
CHC	Charcoal	CRC	Chromous chloride
CHD	Chlorohydrins	CRE	Calcium resinate
CHM	Chloroacetic acid (80% or less)	CRF	Chloroform
CHN	Cyclohexanol	CRH	o-Chlorophenol
CHO	Chloroacetaldehyde	CRL	m-Cresol
CHP	Cyclohexanone peroxide	CRN	p-Chlorotoluene
CHS	Chromic sulfate	CRO	o-Cresol
CHT	Cyclohexenyltrichlorosilane	CRP	Chloroprene
CHX	Cyclohexane	CRS	Cresols
CHY	Calcium hypochlorite	CRT	Chromic acetate
CID	Copper iodide	CSA	Chlorosulfonic acid
CIT	Citric acid	CSC	Cresylate spent caustic solution
CLA	2-Chloropropionic acid	CSF	Copper sulfate
CLC	Calcium chloride	CSN	Copper sulfate, ammoniated
CLD	Collodion	CSO	p-Cresol

CSS	Caustic soda solution	DCM	Dichloromethane
CST	Copper subacetate	DCO	Decanoic acid
CSY	Corn syrup	DCP	2,4-Dichlorophenol
CTA	Crotonaldehyde	DCR	N,N-Dimethylcarbamoyl chloride
CTC	Catechol	DCS	Dodecylbenzenesulfonic acid, calcium salt
CTD	4-Chloro-o-toluidine	DCT	1,1-Dichloro-1-nitroethane
CTF	Chlorine trifluoride	DCV	Dichlorvos
CTM	m-Chlorotoluene	DCY	4,6-Dinitro-o-cyclohexyl phenol
CTO	o-Chlorotoluene	DDB	Dodecylbenzene
CTP	Coal tar pitch	DDC	1-Dodecene
CTT	Copper tartrate	DDD	DDD
CUF	Copper formate	DDI	2,2-Dimethylpropane-1,3-diol
CUM	Cumene	DDM	Dodecylmethacrylate
CWD	Creosote (wood)	DDN	Dodecanol
CXY	Carbon oxyfluoride	DDP	Dodecyl/pentadecyl methacrylate
CYA	Cyanoacetic acid	DDS	Dodecyl sulfate, sodium salt
CYC	Cyclohexyl acetate	DDT	DDT
CYE	Cycloheptane	DDW	Dimethylhexane dihydroperoxide
CYG	Cyanogen	DEA	Diethanolamine
CYP	Cyclopentane	DEB	Diethylbenzene
CYT	1,5,9-Cyclododecatriene	DEC	Diethyl carbonate
DAA	Diacetone alcohol	DED	Dieldrin
DAC	Dimethylacetamide	DEE	2,2-Dichloroethyl ether
DAE	N,N-Diethylethanolamine	DEG	Diethylene glycol
DAI	Dodecylbenzenesulfonic acid, isopropylamine salt	DEH	Di-(2-ethylhexyl) adipate
DAL	Decaldehyde	DEK	Diethyl ketone
DAM	Diphenylamine	DEL	1,2-Dichloroethylene
DAN	n-Decyl alcohol	DEM	Diethylene glycol monobutyl ether acetate
DAP	Di-n-amyl phthalate	DEN	Diethylamine
DAR	n-Decyl acrylate	DEP	Di-(2-ethylhexyl)phosphoric acid
DAS	Dodecyl benzene sulfonic acid, sodium salt	DER	Butyl, decyl, cetyl-eicosyl methacrylate
DBA	Di-n-butylamine	DES	2,4-D esters
DBC	Diisobutylcarbinol	DET	Diethylenetriamine
DBE	Di-n-butyl ether	DEZ	Diethylzinc
DBH	Dibromomethane	DFA	Difluorophosphoric acid
DBK	Di-n-butyl ketone	DFE	1,1-Difluoroethane
DBL	Diisobutylene	DFP	Distillates: flashed feed stocks
DBM	m-Dichlorobenzene	DFM	Dichloromonofluoromethane
DBN	Dibenzyl ether	DGA	Diethylene glycol ethyl ether acetate
DBO	o-Dichlorobenzene	DGD	Diethylene glycol dimethyl ether
DBP	p-Dichlorobenzene	DGE	Diethylene glycol monoethyl ether
DBR	Decaborane	DGL	Diethylene glycol phthalate
DBS	Dodecylbenzenesulfonic acid, triethanolamine salt	DGM	Diethylene glycol monomethyl ether
DBT	Dibutylphenol	DGR	Diethylene glycol methyl ether acetate
DBU	Diisobutylamine	DGT	Dimethyl glutarate
DBZ	n-Decylbenzene	DGY	Dipropylene glycol dibenzoate
DCA	2,4-Dichlorophenoxyacetic acid	DHA	Di-n-hexyl adipate
DCB	Dichlorobutene	DHE	Diethylene glycol n-hexyl ether
DCC	Decane	DHN	Decahydronaphthalene
DCE	1-Decene	DHP	Diheptyl phthalate
DCF	Dichlorodifluoromethane	DHX	1,6-Dichlorohexane
DCH	1,1-Dichloroethane	DIA	Diisopropylamine
DCI	2,2'-Dichloroisopropyl ether	DIB	Dichlobenil
DCL	Dichlone	DIC	Dicamba
		DID	Diisodecyl phthalate
		DIE	Di-(2-ethylhexyl)phthalate

DIF	Dinonyl phthalate	DPE	Diphenyl ether
DIG	Diethylene glycol dibutyl ether	DPF	2,3-Dichloropropene
DIH	Diisopropylbenzene hydroperoxide	DPG	Dipropylene glycol
DII	Diisopropyl naphthalene	DPH	Diethyl phthalate
DIK	Diisobutyl ketone	DPI	Dimethyl hydrogen phosphite
DIL	Diphenyl	DPM	Diphenylmethane diisocyanate
DIM	Dimethyl ether	DPN	Dipentene
DIN	Diisononyl phthalate	DPO	Dibenzoyl peroxide
DIO	Diisooctyl phthalate	DPP	1,2-Dichloropropane
DIP	Diisopropanolamine	DPT	Dicyclopentadiene
DIQ	Diquat	DPU	1,3-Dichloropropene
DIS	Disulfoton	DPY	Dipropylene glycol methyl ether
DIT	Diisobutyl phthalate	DSA	Dodecylbenzenesulfonic acid
DIU	Diuron	DSD	Dodecyl sulfate, diethanolamine salt
DIX	Diisopropylbenzene (all isomers)	DSE	Dimethyl succinate
DLA	Dimethyl adipate	DSF	Dimethyl sulfate
DLP	2,2-Dichloropropanoic acid	DSL	Dimethyl sulfide
DLS	N,N-Dimethyl acetamide solution (40% or less)	DSM	Dodecyl sulfate, magnesium salt
DMA	Dimethylamine	DSR	Distillates: straight run
DMB	Dimethylethanolamine	DSS	Diocetyl sodium sulfosuccinate
DMD	Dimethyldichlorosilane	DST	Dodecyl sulfate, triethanolamine salt
DME	Diethylene glycol monobutyl ether	DSU	Diethyl sulfate
DMF	Dimethylformamide	DSZ	Diammonium salt of zinc edta
DMH	1,1-Dimethylhydrazine	DTC	Dodecyltrichlorosilane
DML	1,2-Dimethylhydrazine	DTE	Dichlorotetrafluoroethane
DMM	2,6-Dimethylaniline	DTH	Dowtherm
DMN	2,6-Diethylaniline	DTL	Dimethyl phthalate
DMO	2,2-Dimethyloctanoic acid	DTM	4,4'-Dichloro-alpha-trichloromethyl benzhydrol
DMP	Dimethylpolysiloxane	DTN	Demeton
DMS	Dimethyl sulfoxide	DTP	Ditridecyl phthalate
DMT	Dimethyl terephthalate	DTS	Dextrose solution
DMX	Dichloropropene, dichloropropane mixture	DTT	2,4-Dinitrotoluene
DMZ	Dimethylzinc	DUP	Diundecyl phthalate
DNA	Di-n-propylamine	DUR	Dursban
DNB	m-Dinitrobenzene	DXN	N,n-Dimethylcyclohexylamine
DNC	Dinitrocresol	DZN	Diazinon
DNE	2,5-Dinitrophenol	DZP	Di-(p-chlorobenzoyl) peroxide
DNH	2,6-Dinitrophenol	EAA	Ethyl acetoacetate
DNL	2,6-Dinitrotoluene	EAC	Ethyl acrylate
DNO	o-Dinitrobenzene	EAD	Ethylaluminum dichloride
DNP	2,4-Dinitrophenol	EAI	2-Ethylhexyl acrylate
DNT	2,4-Dinitroaniline	EAK	Ethyl amyl ketone
DNU	3,4-Dinitrotoluene	EAL	Ethyl alcohol
DNY	Diisononyl adipate	EAM	Ethylamine
DNZ	p-Dinitrobenzene	EAS	Ethylaluminum sesquichloride
DOA	Diocetyl adipate	EBA	N-Ethyl-n-butylamine
DOD	Dodecene	EBK	Ethyl butyl ketone
DOL	Dodecyl phenol	EBR	Ethyl butyrate
DOP	Diocetyl phthalate	EBT	Ethyl butanol
DOS	Dodecyl diphenyl ether disulfonate solution	ECA	Ethyl chloroacetate
DOX	1,4-Dioxane	ECC	N-Ethylcyclohexylamine
DPA	Dibutyl phthalate	ECF	Ethyl chloroformate
DPB	1,1-Dichloropropane	ECH	Ethylene chlorohydrin
DPC	1,3-Dichloropropane	ECL	Ethyl chloride
DPD	Diphenyldichlorosilane	ECS	Ethyldichlorosilane

ECT	Ethyl chlorothioformate	ETC	Ethylene cyanohydrin
ECY	Ethyl cyclohexane	ETD	Ethoxylated tridecanol
EDA	Ethylenediamine	ETE	2-Ethyl toluene
EDB	Ethylene dibromide	ETG	Ethoxy triglycol
EDC	Ethylene dichloride	ETH	Ethane
EDR	Endrin	ETI	Ethyleneimine
EDT	Ethylenediamine tetracetic acid	ETL	Ethylene
EEA	2-Ethoxyethyl acetate	ETM	Ethyl methacrylate
EEE	Ethylene glycol diethyl ether	ETN	Ethyl nitrite
EEO	2-Ethoxyethanol	ETO	Ethion
EEP	Ethyl-3-ethoxypropionate	ETS	Ethyltrichlorosilane
EET	Ethyl ether	EVO	Epoxidized vegetable oils
EFM	Ethyl formate	FAC	Ferric ammonium citrate
EGA	Ethylene glycol monoethyl ether acetate	FAL	Furfuryl alcohol
EGB	Ethylene glycol dibutyl ether	FAM	Formamide
EGD	Ethylene glycol dimethyl ether	FAN	2-Fluoroaniline
EGE	Ethylene glycol monoethyl ether	FAO	Ferric ammonium oxalate
EGI	Ethylene glycol isopropyl ether	FAS	Ferrous ammonium sulfate
EGL	Ethylene glycol	FCL	Ferric chloride
EGM	Ethylene glycol monobutyl ether	FCP	Ferric glycerophosphate
EGO	Ethylene glycol acetate	FEC	Ferrous chloride
EGP	Ethylene glycol propyl ether	FFA	Furfural
EGT	Ethylene glycol methyl ether acetate	FFB	Ferrous fluoroborate
EGY	Ethylene glycol diacetate	FFX	Ferric fluoride
EHA	Ethylhexaldehyde	FLA	4-Fluoroaniline
EHC	2-Ethylhexyl acetate	FLB	Fluorobenzene
EHE	Ethyl hexyl phthalate	FLT	2-Fluorotoluene
EHM	2-Ethylhexylamine	FMA	Formic acid
EHO	2-Ethylhexanoic acid	FMS	Formaldehyde solution
EHP	Ethoxydihydropyran	FNT	Ferric nitrate
EHT	Ethyl hexyl tallate	FOX	Ferrous oxalate
EHX	2-Ethyl hexanol	FPS	Ferrophosphorus
ELT	Ethyl lactate	FRS	Ferrous sulfate
EMA	Ethylene glycol monobutyl ether acetate	FSA	Fluosulfonic acid
EMC	Ethyl mercaptan	FSF	Ferric sulfate
EME	Ethylene glycol monomethyl ether	FSL	Fluosilicic acid
EMN	n-Ethyl morpholine	FSN	Ferrosilicon
EMX	Ethylenediamine	FTO	3-Fluorotoluene
ENB	Ethylidene norbornene	FTU	4-Fluorotoluene
ENP	Ethoxylated nonylphenol	FUM	Fumaric acid
EOD	Ethoxylated dodecanol	FUR	Furan
EOP	Ethoxylated pentadecanol	FXX	Fluorine
EOT	Ethoxylated tetradecanol	GAC	Glyoxylic acid (50% or less)
EOX	Ethylene oxide	GAK	Gasoline blending stocks: alkylates
EPA	2-Ethyl-3-propylacrolein	GAT	Gasolines: automotive (<4.23g lead/gal)
EPC	Epichlorohydrin	GAV	Gasolines: aviation (< 4.86g lead/gal)
EPD	Ethyl phosphonothioic dichloride	GCM	Glycidyl methacrylate
EPE	Ethylene glycol phenyl ether	GCR	Glycerine
EPL	Ethylphenol	GCS	Gasolines: casinghead
EPP	Ethyl phosphorodichloridate	GLA	Gallic acid
EPR	Ethyl propionate	GOC	Gas oil: cracked
EPS	Ethylphenyldichlorosilane	GOS	Glyoxal
ESC	Ethyl silicate	GPL	Gasolines: polymer
ESF	Endosulfan	GRF	Gasoline blending stocks: reformates
ETA	Ethyl acetate	GSR	Gasolines: straight run
ETB	Ethylbenzene	GTA	Glutaraldehyde solution

HAC	Hexadecyltrimethylammonium chloride	IOC	Isooctaldehyde
HAE	Hexyl acetate	IPA	Isopropyl alcohol
HAI	2-Hydroxyethyl acrylate	IPC	Isopropyl percarbonate
HAL	n-Hexaldehyde	IPD	Isophorone diisocyanate
HAS	Hydroxylamine sulfate	IPE	Isopropyl ether
HBA	2-Hydroxy-4-(methylthio)-butanoic acid	IPH	Isophorone
HBR	Hydrogen bromide	IPI	Isophorone diamine
HCB	Hexachlorobutadiene	IPL	Isophthalic acid
HCC	Hexachlorocyclopentadiene	IPM	Isopropyl mercaptan
HCE	Hexachloroethane	IPP	Isopropylamine
HCL	Hydrochloric acid	IPR	Isoprene
HCN	Hydrogen cyanide	IPT	Isopentane
HCP	Hexachlorophene	IPX	Isopropyl cyclohexane
HCZ	Hexachlorobenzene	ISA	Isodecyl alcohol
HDA	Hydroxylamine	ISP	o-Isopropyl phenol
HDC	Hydrogen chloride	IVA	Isovaleraldehyde
HDQ	Hydroquinone	JPF	Jet fuels: JP-4
HDS	Hydrogen sulfide	JPO	Jet fuels: JP-1
HDZ	Hydrazine	JPT	Jet fuels: JP-3
HEP	Heptanoic acid	JPV	Jet fuels: JP-5
HFA	Hydrofluoric acid	KPE	Kepone
HFS	Hydrofluorosilicic acid (25% or less)	KRS	Kerosene
HFX	Hydrogen fluoride	LAC	Lead acetate
HMD	Hexamethylenediamine	LAH	Lithium aluminum hydride
HMI	Hexamethylenimine	LAL	Linear alcohols
HMT	Hexamethylenetetramine	LAR	Lead arsenate
HPA	Hydroxypropyl acrylate	LBC	Lithium bichromate
HPE	Heptyl acetate	LCL	Lead chloride
HPM	Hydroxypropyl methacrylate	LCR	Lithium chromate
HPO	Hydrogen peroxide	LFB	Lead fluoroborate
HPT	Heptane	LFR	Lead fluoride
HSS	Hexadecyl sulfate, sodium salt	LHD	Lithium hydride
HTC	Heptachlor	LID	Lead iodide
HTE	1-Heptene	LLS	Latex, liquid synthetic
HTN	Heptanol	LNG	Liquefied natural gas
HXA	n-Hexane	LNI	Lactonitrile solution (80% or less)
HXE	1-Hexene	LNT	Lead nitrate
HXG	Hexylene glycol	LPG	Liquefied petroleum gas
HXN	1-Hexanol	LPO	Lauroyl peroxide
HXO	Hexanoic acid	LRA	Lauric acid
HXX	Hydrogen	LRM	Lauryl mercaptan
IAA	Isoamyl alcohol	LSA	Lead stearate
IAC	Isopropyl acetate	LSF	Lead sulfate
IAI	Isodecyl acrylate	LSU	Lead sulfide
IAL	Isobutyl alcohol	LTA	Lactic acid
IAM	Isobutylamine	LTC	Lead thiocyanate
IAT	Isoamylacetate	LTH	Litharge
IBA	Isobutyl acetate	LTM	Lithium
IBL	Isobutylene	LTS	Lead thiosulfate
IBN	Isobutyronitrile	LTT	Lead tetraacetate
IBR	Isobutyric acid	LTU	Lead tungstate
IBT	Isobutane	MAA	Methyl amyl alcohol
IDA	Isodecaldehyde	MAC	Methyl amyl acetate
IGE	Isopropyl glycidyl ether	MAD	Methacrylic acid
IHA	Isohexane	MAE	Methyl acetoacetate
IOA	Isooctyl alcohol	MAK	Methylamyl ketone



MAL	Methyl alcohol	MLI	Maleic acid
MAM	Methyl acrylate	MLL	Methyl allyl alcohol
MAN	N-methylaniline	MLP	3-Methylpyridine
MAP	Methyl acetylene, propadiene mixture	MLT	Malathion
MAT	Mercuric acetate	MMC	Methyl mercaptan
MBA	a-Methylbenzyl alcohol	MME	Monomethyl ethanolamine
MBE	Methyl tert-butyl ether	MMM	Methyl methacrylate
MBK	Methyl n-butyl ketone	MNA	1-Methylnaphthalene
MBL	Methyl butenol	MNS	Mineral spirits
MBO	3-Methyl-2-butanone	MNT	Mercuric nitrate
MBU	Methyl butyrate	MOA	3-Methoxybutyl acetate
MBY	Methyl butynol	MOC	Methoxychlor
MBZ	Methyl benzoate	MOX	Mercuric oxide
MCA	Chloroacetic acid	MPA	Monoisopropanolamine
MCC	Mercuric ammonium chloride	MPC	Magnesium perchlorate
MCD	Mercaptodimethur	MPD	Methyl phosphonothioic dichloride
MCF	Chlorodifluoromethane	MPE	2-Methyl-1-pentene
MCK	Methylcyclopentadiene dimer	MPF	4-Methylpyridine
MCL	Methallyl chloride	MPK	Methyl isopropenyl ketone
MCM	Monochlorotrifluoromethane	MPL	Morpholine
MCN	Mercuric cyanide	MPR	2-Methylpyridine
MCO	Metolachlor	MPT	Methyl parathion
MCP	Methyl cyclopentane	MPY	1-Methylpyrrolidone
MCR	Mercury	MRC	Mercuric chloride
MCS	Methyldichlorosilane	MRE	Myrcene
MCT	Methylcyclopentadienylmanganese tricarbonyl	MRN	Mercurous nitrate
MCX	o-Methylcyclohexanone	MRR	Mercurous chloride
MCY	Methylcyclohexane	MRS	Mercuric sulfate
MDC	Methyl dichloroacetate	MRT	Mercuric thiocyanate
MDE	Methyl diethanolamine	MRX	Mirex
MEA	Monoethanolamine	MSA	Methanearsonic acid, sodium salt
MED	Methyl chloroacetate	MSF	Mercuric sulfide
MEK	Methyl ethyl ketone	MSO	Mesityl oxide
MEN	2-Methyl-6-ethyl aniline	MSR	alpha-Methylstyrene
MEP	Methylethylpyridine	MSZ	Methylamine solution
MES	Methyl salicylate	MTA	Methylamine
MET	Methacrylonitrile	MTB	Methyl bromide
MFA	Lead alkyls	MTC	Methyl chloride
MFM	Methyl formate	MTE	Monochlorotetrafluoroethane
MGN	Magnesium nitrate	MTF	Methyl formal
MGX	Magnesium	MTH	Methane
MHB	2-Methyl-2-hydroxy-3-butyne	MTN	4-Methyl-1-pentene
MHC	Methyl chloroformate	MTO	Molybdic trioxide
MHK	Methyl heptyl ketone	MTS	Methyltrichlorosilane
MHX	2-Methylcyclohexanol	MTT	Methyl acetate
MHZ	Methylhydrazine	MVK	Methyl vinyl ketone
MIC	Methyl isobutyl carbinol	NAA	Nitrilotriacetic acid and salts
MID	Mercuric iodide	NAB	Nabam
MIK	Methyl isobutyl ketone	NAC	Nitric acid
MIO	Methyl iodide	NAE	Nonyl acetate
MIS	Methyl isocyanate	NAL	4-Nitroaniline
MIT	Methyl isothiocyanate	NAN	Nonane
MKE	Methyl propyl ketone	NAO	1-Naphthylamine
MLA	Maleic anhydride	NAS	Nickel ammonium sulfate
MLH	Maleic hydrazide	NBR	Nickel bromide
		NCL	Nickel chloride

NCN	Nickel cyanide	OET	Octyl epoxy tallate
NCS	Nicotine sulfate	OFR	Oils, fuel: 4
NCT	Naphtha: coal tar	OFS	Oils, edible: fish
NEA	Neodecanoic acid	OFV	Oils, fuel: 5
NFB	Nickel fluoroborate	OIL	Oils: crude
NFM	Nickel formate	OLA	Oleic acid
NHX	Neohexane	OLB	Oils, miscellaneous: lubricating
NIC	Nicotine	OLD	Oils, edible: lard
NIE	o-Nitrotoluene	OLM	Oleum
NIP	3-Nitrophenol	OLS	Oils, miscellaneous: linseed
NKA	Nickel acetate	OMN	Oils, miscellaneous: mineral
NKC	Nickel carbonyl	OMS	Oils, miscellaneous: mineral seal
NKH	Nickel hydroxide	OMT	Oils, miscellaneous: motor
NKS	Nickel sulfate	ONF	Oils, miscellaneous: neatsfoot
NLD	Naled	OOD	Oils, fuel: 1-D
NMT	Nitromethane	OOL	Oils, edible: olive
NNE	1-Nonene	OON	Oils, fuel: no. 1
NNN	Nonanol	OPI	Oil, misc: pine
NNP	Nonylphenol	OPM	Oils, edible: palm
NNT	Nickel nitrate	OPN	Oils, edible: peanut
NON	Nonene	OPT	Oils, miscellaneous: penetrating
NOX	Nitrogen tetroxide	ORD	Oils, miscellaneous: road
NPH	4-Nitrophenol	ORG	Oils, miscellaneous: range
NPN	1-Nitropropane	ORN	Oils, miscellaneous: rosin
NPP	2-Nitropropane	ORS	Oils, miscellaneous: resin
NSS	Naphtha: stoddard solvent	OSB	Oils, edible: soya bean
NSV	Naphtha: solvent	OSD	Oils, miscellaneous: spindle
NTA	2-Nitroaniline	OSF	Oils, edible: safflower
NTB	Nitrobenzene	OSP	Oils, miscellaneous: sperm
NTC	Nitrosyl chloride	OSX	Oils, fuel: no. 6
NTE	Nitroethane	OSY	Oils, miscellaneous: spray
NTI	Naphthenic acids	OTA	Octanol
NTL	Nitralin	OTB	Oils, miscellaneous: turbine
NTM	Naphthalene	OTC	Oils, edible: tucum
NTO	Nitrous oxide	OTD	Oils, fuel: 2-D
NTP	2-Nitrophenol	OTE	1-Octene
NTR	m-Nitrotoluene	OTF	Oils, miscellaneous: transformer
NTT	p-Nitrotoluene	OTL	Oils, miscellaneous: tall
NTX	Nitric oxide	OTN	Oils, miscellaneous: tanner's
NVM	Naphtha: VM & P	OTW	Oils, fuel: 2
NXX	Nitrogen	OVG	Oils, edible: vegetable
OAA	Octanoic acid	OXA	Oxalic acid
OAC	Oleic acid, sodium salt	OXY	Oxygen
OAL	Octyl aldehydes	PAA	Peracetic acid
OAN	Octane	PAC	Phosphoric acid
OAP	Oleic acid, potassium salt	PAD	Propionaldehyde
OAS	Oils, miscellaneous: absorption	PAH	Propionic anhydride
OCA	Oils, edible: castor	PAL	n-Propyl alcohol
OCC	Oils, edible: coconut	PAM	2-Propanolamine
OCF	Oils: clarified	PAN	Phthalic anhydride
OCN	Oil, misc: cashew nut shell	PAS	Potassium arsenate
OCR	Oils, miscellaneous: croton	PAT	n-Propyl acetate
OCS	Oils, edible: cottonseed	PBO	Potassium binoxalate
OCT	Oils, miscellaneous: coal tar	PBP	Propylene butylene polymer
ODP	Octyl decyl phthalate	PBR	Phosphorus tribromide
ODS	Oils: diesel	PBZ	n-Propylbenzene

PCB	Polychlorinated biphenyl	PPT	Phosphorus trichloride
PCE	Pentachloroethane	PPW	Phosphorus, white
PCH	Potassium chromate	PPZ	Piperazine
PCL	Perchloric acid	PRA	n-Propylamine
PCM	Perchloromethyl mercaptan	PRC	n-Propyl chloride
PCN	Propionitrile	PRD	Pyridine
PCP	Pentachlorophenol	PRE	n-Propyl ether
PCR	Potassium chlorate	PRG	Propargite
PDC	Pentadecanol	PRO	Propargyl alcohol
PDE	1,3-Pentadiene	PRP	Propane
PDH	Paraldehyde	PRR	Pyrethrins
PDL	Phenyldichloroarsine	PTA	Pentane
PDN	1,4-Pentadiene	PTB	Pentaborane
PDT	Potassium dichloro-s-triazinetriene	PTC	Potassium cyanide
PEB	Polyethylene polyamines	PTD	Potassium dichromate
PEN	Pentaethylenehexamine	PTE	1-Pentene
PET	Pentaerythritol	PTH	Potassium hydroxide
PFA	Paraformaldehyde	PTI	Potassium iodide
PGA	Pyrogalllic acid	PTL	Petrolatum
PGC	Polypropylene glycol	PTM	Potassium
PGM	Polypropylene glycol methyl ether	PTN	Petroleum naphtha
PGN	Propylene glycol methyl ether acetate	PTO	Parathion
PGY	Propylene glycol ethyl ether	PTP	Potassium permanganate
PHD	Phosdrin	PTR	Propylene trimer
PHE	Phenylhydrazine	PTS	Potassium oxalate
PHG	Phosgene	PTT	Propylene tetramer
PHH	Phenylhydrazine hydrochloride	PXE	1-Phenyl-1-xylyl ethane
PHN	Phenol	PXP	n-Propoxypropanol
PII	Propyleneimine	QNL	Quinoline
PIN	Pinene	RSC	Resorcinol
PLA	n-Propanolamine	SAB	Sodium alkylbenzenesulfonates
PLB	Polybutene	SAC	Sulfuric acid, spent
PLP	Polypropylene	SAL	Salicylaldehyde
PLT	beta-Propiolactone	SAM	Sodium amide
PMA	Phenylmercuric acetate	SAR	Sodium arsenite
PME	Propylene glycol methyl ether	SAS	Sodium alkyl sulfates
PMN	n-Propyl mercaptan	SAT	Sodium fluoroacetate
PNA	Propionic acid	SAU	Sodium aluminate solution (45% or less)
PNE	2-Pentanone	SAZ	Sodium azide
PNI	n-Propyl nitrate	SBF	Sodium bifluoride
PNR	Potassium nitrate	SBH	Sodium borohydride
POA	Potassium arsenite	SBS	Sodium bisulfite
POC	Pentanoic acid	SBT	Sorbitol
POE	Potassium oleate	SBX	Sodium hydroxide solution
POP	Potassium peroxide	SCD	Sodium cacodylate
POX	Propylene oxide	SCH	Sodium chromate
PPA	Polyphosphoric acid	SCL	Sulfuryl chloride
PPB	Phosphorus, black	SCM	Strontium chromate
PPD	Propanedinitrile	SCN	Sodium cyanide
PPE	n-Pentyl propionate	SCR	Sodium dichromate
PPG	Propylene glycol	SCY	Sodium thiocyanate
PPI	Polymethylene polyphenyl isocyanate	SDA	Sodium arsenate
PPL	Propylene	SDB	Sodium borate
PPO	Phosphorus oxychloride	SDC	Sodium chlorate
PPP	Phosphorus pentasulfide	SDD	Sodium chlorate solution
PPR	Phosphorus, red	SDF	Sodium fluoride

SDH	Sodium hydride	TCB	1,2,4-Trichlorobenzene
SDN	Sodium nitrate	TCE	Trichloroethane
SDS	Sodium sulfide	TCF	Trichlorofluoromethane
SDT	Sodium dichloro-s-triazinetriene	TCH	Trichloroacetaldehyde
SDU	Sodium	TCL	Trichloroethylene
SFA	Sulfuric acid	TCM	1,1,2-Trichloroethane
SFC	Sodium ferrocyanide	TCN	1,2,3-Trichloropropane
SFD	Sulfur dioxide	TCO	Tricresyl phosphate ( $\geq 1\%$ ortho isomer)
SFL	Sulfolane	TCP	Tricresyl phosphate ( $<1\%$ ortho isomer)
SFM	Sulfur monochloride	TCS	Trichlorosilane
SFR	Sodium silicofluoride	TCT	Trichloro-s-triazinetriene
SHC	Sodium hypochlorite	TDA	Toluenediamine
SHD	Sodium hydroxide	TDB	Tetradecylbenzene
SHP	Sodium hypochlorite solution	TDC	1-Tridecene
SHR	Sodium hydrosulfide solution	TDI	Toluene 2,4-diisocyanate
SHX	Sodium hydrogen sulfite solution (35% or less)	TDN	Tridecanol
SLA	Salicylic acid	TEA	Triethanolamine
SLD	Selenium dioxide	TEB	Triethylbenzene
SMB	Sodium 2-mercaptobenzothiazol solution	TEC	Tetrachloroethane
SML	Sodium methylate	TED	Tetraethyl dithiopyrophosphate
SNI	Sodium nitrite solution	TEG	Triethylene glycol
SNT	Sodium nitrite	TEL	Tetraethyl lead
SOX	Sodium oxalate	TEN	Triethylamine
SPC	Sodium pentachlorophenate	TEP	Tetraethyl pyrophosphate
SPH	Sodium phosphate, tribasic	TES	2,4,5-T esters
SPP	Sodium phosphate	TET	Triethylenetetramine
SRA	Stearic acid	TFA	Tallow fatty alcohol
SRS	Sucrose	TFC	Trifluorochloroethylene
SSC	Sodium silicate	TFE	Tetrafluoroethylene
SSE	Sodium selenite	TFR	Trifluralin
SSF	Sodium sulfite	TGC	Tripropylene glycol
STC	Silicon tetrachloride	TGD	Triethylene glycol di-(2-ethylbutyrate)
STF	Stannous flouride	TGE	Triethylene glycol ethyl ether
STN	Strontium nitrate	TGM	Tripropylene glycol methyl ether
STO	Selenium trioxide	TGY	Triethylene glycol methyl ether
STR	Strychnine	THA	Trimethyl hexamethylene diamine
STS	Sodium thiocyanate solution (56% or less)	THB	Thallium carbonate
STY	Styrene	THC	Thiocarbamide
SVA	Silver acetate	THF	Tetrahydrofuran
SVC	Silver carbonate	THI	Trimethylhexamethylene diisocyanate
SVF	Silver fluoride	THN	Tetrahydronaphthalene
SVI	Silver iodate	THR	Thiram
SVN	Silver nitrate	TIA	Triisobutylaluminum
SVO	Silver oxide	TIB	Triisobutylene
SVS	Silver sulfate	TIP	Triisopropanolamine
SXX	Sulfur	TLA	Thallium acetate
TAA	Trimethylacetic acid	TLI	o-Toluidine
TAL	Triethylaluminum	TLO	Tallow
TAP	p-Toluenesulfonic acid	TMA	Trimethylamine
TAS	2,4,5-Trichlorophenoxyacetic acid, sodium salt	TMC	Trimethylchlorosilane
TBP	Tributyl phosphate	TME	1,2,4-Trimethylbenzene
TBT	Tetrabutyl titanate	TML	Tetramethyl lead
TBZ	1,2,3-Trichlorobenzene	TMP	1-Isobutyrate
TCA	2,4,5-Trichlorophenoxyacetic acid	TNA	Tannic acid
		TNI	Thallium nitrate
		TNM	Tetranitromethane

TOD	p-Toluidine	VTS	Vinyltrichlorosilane
TOF	Tall oil, fatty acid	WCA	Waxes: carnauba
TOI	m-Toluidine	WPF	Waxes: paraffin
TOL	Toluene	WSL	White spirit (low (15-20%) aromatic)
TPA	2-(2,4,5-Trichlorophenoxy) propanoic acid	XLM	m-Xylene
TPE	Isooctyl ester	XLO	o-Xylene
TPG	Thiophosgene	XLP	p-Xylene
TPH	Trichlorophenol	XYL	Xylenol
TPI	Triethyl phosphite	ZAC	Zinc ammonium chloride
TPO	Tris(Aziridinyl)phosphine oxide	ZAR	Zinc arsenate
TPP	Trimethyl phosphite	ZBC	Zinc bichromate
TPS	Triethyl phosphate	ZBO	Zinc borate
TPT	Turpentine	ZBR	Zinc bromide
TRB	Tridecylbenzene	ZCA	Zirconium acetate
TRC	Trichlorfon	ZCB	Zinc carbonate
TRD	Tridecane	ZCL	Zinc chloride
TRL	Tripropylamine	ZCN	Zinc cyanide
TRN	Thorium nitrate	ZCO	Zirconium oxychloride
TRP	Trixylenyl phosphate	ZCR	Zinc chromate
TSU	Thallium sulfate	ZCS	Zirconium sulfate
TTB	1,2,3,5-Tetramethylbenzene	ZCT	Zirconium tetrachloride
TTD	1-Tetradecene	ZDP	Zinc dialkyldithiophosphate
TTE	Tetrachloroethylene	ZEC	Zectran
TTF	1,1,2-Trichloro-1,2,2-trifluoroethane	ZFB	Zinc fluoroborate
TTG	Tetraethylene glycol	ZFM	Zinc formate
TTN	Tetradecanol	ZFX	Zinc fluoride
TTP	Tetraethylenepentamine	ZHS	Zinc hydrosulfite
TTT	Titanium tetrachloride	ZIR	Zirconium nitrate
TXP	Toxaphene	ZNA	Zinc acetate
UAN	Uranyl nitrate	ZNT	Zinc nitrate
UAS	Urea, ammonium nitrate soln (w/aqua ammonia)	ZPC	Zinc potassium chromate
UDA	Undecanoic acid	ZPF	Zirconium potassium flouride
UDB	n-Undecylbenzene	ZPP	Zinc phosphide
UDC	1-Undecene	ZPS	Zinc phenolsulfonate
UND	Undecanol	ZSF	Zinc sulfate
UPO	Urea peroxide	ZSL	Zinc silicofluoride
URA	Uranyl acetate		
URE	Urea		
URP	Uranium peroxide		
URS	Uranyl sulfate		
VAL	Valeraldehyde		
VAM	Vinyl acetate		
VBL	Vanillan black liquor		
VCH	Vinylcyclohexene		
VCI	Vinylidene chloride		
VCM	Vinyl chloride		
VEE	Vinyl ethyl ether		
VFI	Vinyl fluoride		
VME	Vinyl methyl ether		
VND	Vinyl neodecanoate		
VNO	Vanadium oxide		
VNT	Vinyl toluene		
VOT	Vanadium oxytrichloride		
VOX	Vanadium pentoxide		
VSF	Vanadyl sulfate		

## 10. DATA SOURCES

The source of every item of data contained in section 11 is recorded in master data files and is available on request. The principal sources are listed below. Many other sources were consulted, but most of them provided only a few items and are not given here. In a few cases the information given is based on an analogy with that for a closely related chemical; the analogy was drawn by an expert in the field, whose identity appears in the master data files.

Where a source was used for a single category of data, the source is given in Section 3 ("Explanation of Terms") and is not repeated here.

### 10.1 GENERAL SOURCES

The following sources contained data for many of the 13 data categories used:

1. Manufacturers' Technical Bulletins - This is usually the best single source of general information about the chemical. The bulletins contain the most recent data. Bulletins were not available for a few chemicals that are not items of commerce but are intermediates shipped from one manufacturing site to another.
2. Material Safety Data Sheets - These were provided by the manufacturer using the U.S. Department of Labor Form OSHA-20 or an approved modification.
3. Code of Federal Regulations - Office of the Federal Register, Archives and Record Service, Washington, D.C., 1972. Titles 46 (Shipping) and 49 (Transportation) were used in the most recent revision available, October 1, 1996.
4. Chemical Safety Data Sheets - Chemical Manufacturers Association, Washington, D.C.
5. Industrial Safety Sheets - National Safety Council, Chicago, Illinois.
6. International Maritime Dangerous Goods Code - International Maritime Organization (IMO), London, January 1, 1990.
7. Petroleum Products Handbook - V.B. Guthrie (ed.), McGraw-Hill, New York, 1960.
8. Glossary of Terms Used in Petroleum Refining - 2nd edition, American Petroleum Institute, New York, 1962.
9. The Handling and Storage of Liquid Propellants - Office of Defense Research and Engineering, U.S. Government Printing Office, Washington, D. C., 1963.
10. Industrial Chemicals - W.L. Faith, D.B. Keyes, and R.L. Clark, 3rd edition, Wiley, New York, 1965.
11. Chemical Technology of Petroleum - W.A. Gruse and D.R. Stevens, 3rd edition, McGraw-Hill, New York, 1960.
12. Chemical Rocket/Propellant Hazards - CPIA Publication No. 194, Vol. III, 1970.
13. Organic Solvents - J.A. Riddick and W.B. Bunger, 3rd edition, Wiley-Interscience, New York, 1970.
14. Transport of Dangerous Goods - (4 vols) United Nations, New York, 1981.

15. Kirk-Othmer Encyclopedia of Chemical Technology - 1st edition (1947 - 1960) and 2nd edition (1963 - 1970), Interscience-Wiley, New York.
16. Matheson Gas Data Book - 5th edition, Matheson Gas Products, East Rutherford, New Jersey, 1971.
17. Explosive and Toxic Hazardous Material - J.H. Meidl, Glencoe Press, Beverly Hills, California, 1969.
18. Dangerous Properties of Industrial Materials, 7th edition, N.I. Sax, Van Nostrand Reinhold Company, New York, 1989.
19. Organic Phosphorus Compounds - G.M. Kosolapoff and L. Maier (6 Vols.), Wiley-Interscience, New York.
20. The Chemistry of Organo-Phosphorus Pesticides - C. Fest and K.J. Schmidt, Springer-Verlag, New York, 1973.

## **10.2 CHEMICAL DESIGNATIONS**

1. Commercial Organic Chemical Names - Compiled by the Synthetic Organic Chemical Manufacturers Association (SOCMA), Chemical Abstracts Service, Columbus, Ohio, 1965.
2. Chemical Synonyms and Trade Names - W. Gardner and E.I. Cooke, 7th edition, CRC Press, Cleveland, Ohio, 1971.
3. The Merck Index of Chemical and Drugs - 11th edition, Merck and Co., Rahway, New Jersey, 1989.

## **10.3 HEALTH HAZARDS**

1. Industrial Hygiene and Toxicology - F.A. Patty, 3rd edition, Vol. II, Interscience, New York, 1981.
2. Toxicity and Metabolism of Industrial Solvents - E. Browning, Elsevier, New York, 1965.
3. Practical Toxicology of Plastics - R. Lefaux, CRC Press, Cleveland, Ohio, 1968.
4. Industrial Toxicology - L.T. Fairhall, Williams and Wilkins, 2nd edition, Baltimore, Maryland, 1957.
5. Toxicology of Drugs Chemicals - W.B. Deichman and H.W. Girarde, Academic Press, New York, 1969.
6. Clinical Toxicology of Commercial Products - M.N. Gleason, et al., 4th edition, Williams and Wilkins, Baltimore, Maryland, 1981.
7. Handbook of Toxicology: Acute Toxicities of Solids, Liquids and Gases to Laboratory Animals - W.S. Spector, Saunders, Philadelphia, Pa., 1956.
8. Occupational Diseases: A Guide to their Recognition - U.S. Department of Health, Education, and Welfare. Public Health Service Publication No. 1097. Superintendent of Documents, Washington, D.C., 1964.

9. First Aid Textbook - American National Red Cross, Washington, D.C., 1972.
10. Electrical Safety Practice: Odor Warning for Safety - Monograph 113 Instrument Society of America (ISA), Pittsburgh, Pa., 1972.
11. Toxic Substances - Annual List 1971 - H.E. Christensen, U.S. Department of Health, Education, and Welfare, Superintendent of Documents, Washington, D.C., 1971.
12. Hygienic Guide Series - American Industrial Hygiene Association, Detroit, Michigan, 48227.
13. Toxicity of Industrial Metals - E. Browning, 2nd Edition, Appleton-Century-Crofts, New York, 1969.

#### **10.4 FIRE HAZARDS**

1. The Fire and Explosion Hazards of Commercial Oils - W. Vlachos and C.A. Vlachos, Vlachos and Co., Philadelphia, Pa., 1921.
2. 1972 Annual Book of ASTM Standards - American Society for Testing and Materials, Philadelphia, Pa., 1972.
3. Fire Protection Guide on Hazardous Materials - 10th edition, Nos. 325A, 325M, 49, 491M, and 704M, National Fire Protection Association (NFPA), Boston, Mass., 1991.
4. Fire Protection Handbook - A. E. Cote (ed.), 17th edition, National Fire Protection Association (NFPA), Boston, Mass., 1991.
5. Handbook of Industrial Loss Prevention - 2nd edition, Factory Mutual Engineering Corp., McGraw-Hill, New York, 1967.

#### **10.5 WATER POLLUTION**

1. Water Quality Criteria Data Book - Vol. 1 - Organic Chemicals (1970) and Vol. 2 - Inorganic Chemicals (1971), United States Environmental Protection Administration, Superintendent of Documents, Washington, D.C.
2. Engineering Management of Water Quality - P.H. McGauhey, McGraw-Hill, New York, 1968.
3. The BOD of Textile Chemicals - Proceedings of the American Association of Textile Chemists and Colorists, American Dyestuff Reporter, August 29, 1966, p. 39.
4. Biodegradable Surfactants for the Textile Industry - American Dyestuff Reporter, January 30, 1967.
5. Water Quality Criteria - J.E. McKee and M.W. Wolf, 2nd edition, California State Water Quality Control Board, Sacramento, California, 1963.
6. Water Quality Criteria - National Technical Advisory Committee, Federal Water Pollution Control Administration, Washington, D.C. 1968.
7. Water Quality Characteristics of Hazardous Materials - R.W. Hann, Jr., and P.A. Jensen, Environmental Engineering Division, Texas A and M University, College Station, Texas, 1974.



## 10.6 PHYSICAL AND CHEMICAL PROPERTIES

1. Solubilities of Inorganic and Organic Compounds - H. Stephen and T. Stephen, Macmillan, New York, 1963, Vol. 1, Part 1.
2. The Critical Constants of Organic Compounds - A.P. Kudchadker, G.H. Alani and B.J. Zwolinski, Chemical Reviews, 68,659 (1968).
3. Physical Properties of Hydrocarbons - Vol. 1 (1968) and Vol. 2 (1970), R.W. Gallant, Gulf Publishing Co., Houston, Texas.
4. International Critical Tables - McGraw-Hill, New York, 1926.
5. Handbook of Chemistry and Physics - R.C. Weast (ed.), 62nd edition, CRC Publishing Co., Cleveland, Ohio, 1982.
6. The Properties of Gases and Liquids - R.C. Reid and T.K. Sherwood, 2nd edition, McGraw-Hill, New York, 1966.
7. Thermal Conductivity of Gases and Liquids - N.V. Tsederburg, MIT Press, Cambridge, Mass., 1965.
8. Lange's Handbook of Chemistry - N.A. Lange, 12th edition, McGraw-Hill, New York, 1979.
9. The Chemical Thermodynamics of Organic Compounds - D.R. Stull, et al., Wiley, New York, 1969.
10. Matheson Gas Data Book - 4th edition, Matheson Co., Inc., 1966.
11. Physical Properties of Chemical Compounds - Vol. 1 (1955), Vol. 2 (1959), and Vol. 3 (1961), R.R. Dreisbach, American Chemical Society, Washington, D.C.
12. Beilsteins Handbuch der Organischen Chemie - Springer, Berlin, Germany.
13. Gmelins Handbuch der Anorganischen Chemie - Verlag Chemie, Weinheim, Germany.
14. Solubilities of Inorganic and Organic Compounds - 3rd edition and supplement, A. Seidell and W.F. Linke, Van Nostrand, New York, 1941 - 1952.
15. Selected Values of Physical and Thermodynamics Properties of Hydrocarbons and Related Compounds - F.D. Rossini, et.al., American Petroleum Institute Project 44, American Petroleum Institute, Pittsburgh, Pa., 1953.
16. Heat of Combustion and Formation of Organic Compounds - E.S. Domalski, Journal of Physical and Chemical Reference Data, 1,221 (1972).
17. Surface Tension of Pure Liquid Compounds - J.L. Jasper, J. Phys. Chem. Ref. Data, 1,841 (1972).
18. JANAF Thermochemical Tables - NSRDS - NBS - 37 (1970); 1974 Supplement and complete index, J. Phys. Chem. Ref. Data, 3,311 (1974).

19. Physical and Thermodynamic Properties of Aliphatic Alcohols - R.C. Wilhoit and B.J. Zwolinski, J. Phys. Chem. Ref. Data, 2 (1973), Supplement 1.
20. Critical Constants of Hydrocarbons - C.A. Passut and R.P. Danner, Ind. Eng. Chem., Pro. Des. Devel., 12,365 (1973).

# ISOOCTYL ALCOHOL

IOA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dimethyl-1-hexanols 6-Methyl-1-heptanol Oxo octyl alcohol	Liquid  Colorless  Mild odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, water, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment:  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
 2.2 Formula:  $(CH_3)_2CH(CH_2)_6CH_2OH$   
 2.3 IMO/UN Designation: Not listed  
 2.4 DOT ID No.: Not listed  
 2.5 CAS Registry No.: 26952-21-6  
 2.6 NAERG Guide No.: Not listed  
 2.7 Standard Industrial Trade Classification: 51214

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask in confined areas; plastic gloves; goggles; eye bath and safety shower.  
 3.2 **Symptoms Following Exposure:** Inhalation hazard slight. Skin contact results in moderate irritation. Liquid contact with eyes causes severe irritation and possible eye damage.  
 3.3 **Treatment of Exposure:** Remove to fresh air. Flush skin and eye contact area at once for at least 15 min. Get medical care for eyes.  
 3.4 TLV-TWA: 50 ppm  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5$  to  $5$  g/kg (lab animals)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 IDLH Value: Not listed.  
 3.14 OSHA PEL-TWA: Not listed.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 180°F O.C.  
 4.2 **Flammable Limits in Air:** 0.9% (calc.) 5.7% (est.)  
 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 530°F (est.)  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 17.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+% (mixed isomers)  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** C  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
 8.2 49 CFR Class: Not pertinent  
 8.3 49 CFR Package Group: Not listed.  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
 9.2 Molecular Weight: 130.22  
 9.3 Boiling Point at 1 atm: 367°F = 186°C = 459°K  
 9.4 Freezing Point: <212°F = <100°C = <373°K  
 9.5 Critical Temperature: Not pertinent  
 9.6 Critical Pressure: Not pertinent  
 9.7 Specific Gravity: 0.832 at 20°C (liquid)  
 9.8 Liquid Surface Tension: 29.5 dynes/cm = 0.0295 N/m at 20°C  
 9.9 Liquid Water Interfacial Tension: (est.) 40 dynes/cm = 0.04 N/m at 20°C  
 9.10 Vapor (Gas) Specific Gravity: Not pertinent  
 9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.040  
 9.12 Latent Heat of Vaporization: (est.) 140 Btu/lb = 77 cal/g =  $3.2 \times 10^5$  J/kg  
 9.13 Heat of Combustion: (est.) -17,400 Btu/lb = -9650 cal/g =  $-404 \times 10^5$  J/kg  
 9.14 Heat of Decomposition: Not pertinent  
 9.15 Heat of Solution: Not pertinent  
 9.16 Heat of Polymerization: Not pertinent  
 9.17 Heat of Fusion: Currently not available  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: 0.02 psia

### NOTES

# ISOOCTYL ALCOHOL

IOA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	52.490	122	0.790	50	1.040	68	10.000
54	52.420			52	1.040		
56	52.350			54	1.040		
58	52.280			56	1.040		
60	52.210			58	1.040		
62	52.140			60	1.040		
64	52.070			62	1.040		
66	52.010			64	1.040		
68	51.940			66	1.040		
70	51.870			68	1.040		
72	51.800			70	1.040		
74	51.730			72	1.040		
76	51.660			74	1.040		
78	51.590			76	1.040		
80	51.520			78	1.040		
82	51.450			80	1.040		
84	51.380			82	1.040		
86	51.310			84	1.040		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.070	60	0.004	60	0.00008	100	0.415
		80	0.008	80	0.00019	120	0.425
		100	0.018	100	0.00040	140	0.434
		120	0.038	120	0.00080	160	0.444
		140	0.076	140	0.00153	180	0.453
		160	0.143	160	0.00280	200	0.462
		180	0.260	180	0.00493	220	0.471
		200	0.456	200	0.00839	240	0.480
		220	0.774	220	0.01382	260	0.488
		240	1.274	240	0.02210	280	0.497
		260	2.041	260	0.03440	300	0.505
		280	3.185	280	0.05224	320	0.513
		300	4.857	300	0.07756	340	0.521
		320	7.247	320	0.11280	360	0.528
		340	10.600	340	0.16080	380	0.536
		360	15.220	360	0.22520	400	0.543
		380	21.470	380	0.31020	420	0.550
						440	0.558
						460	0.564
						480	0.571
						500	0.578
						520	0.584
						540	0.590
						560	0.596
						580	0.602
						600	0.608

# ISOOCTALDEHYDE

IOC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dimethylhexanals Isooctylaldehyde 6-Methyl-1-heptanal Oxo octaldehyde	Liquid Colorless Mild fruity odor Floats on water.
Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. LIQUID Irritating to eyes. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 19; Aldehyde  
 2.2 **Formula:** (CH<sub>3</sub>)<sub>2</sub>CH(CH<sub>2</sub>)<sub>6</sub>CHO  
 2.3 **IMO/UN Designation:** Not listed  
 2.4 **DOT ID No.:** Not listed  
 2.5 **CAS Registry No.:** Currently not available  
 2.6 **NAERG Guide No.:** Not listed  
 2.7 **Standard Industrial Trade Classification:** 51621

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Chemical goggles.  
 3.2 **Symptoms Following Exposure:** High vapor concentrations produce eye irritation. Liquid may irritate eyes.  
 3.3 **Treatment of Exposure:** Remove from exposure. Wash eyes with water for 15 min.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 104°F C.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Currently not available  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 320°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 54.7 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
   Bioaccumulation: T  
   Damage to living resources: 3  
   Human Oral hazard: 1  
   Human Contact hazard: I  
   Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Currently not available  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** B  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 128.22  
 9.3 **Boiling Point at 1 atm:** 307-352°F = 153-178°C = 426-451°K  
 9.4 **Freezing Point:** -180°F = -118°C = 155°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.825 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 26.9 dynes/cm = 0.0269 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.040  
 9.12 **Latent Heat of Vaporization:** 140 Btu/lb = 77 cal/g = 3.2 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** (est.) -17,000 Btu/lb = -9600 cal/g = -400 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISOOCTALDEHYDE

IOC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	51.500	50	0.478	50	1.040	68	1.100
52	51.500	52	0.478	52	1.040		
54	51.500	54	0.478	54	1.040		
56	51.500	56	0.478	56	1.040		
58	51.500	58	0.478	58	1.040		
60	51.500	60	0.478	60	1.040		
62	51.500	62	0.478	62	1.040		
64	51.500	64	0.478	64	1.040		
66	51.500	66	0.478	66	1.040		
68	51.500	68	0.478	68	1.040		
70	51.500	70	0.478	70	1.040		
72	51.500	72	0.478	72	1.040		
74	51.500	74	0.478	74	1.040		
76	51.500	76	0.478	76	1.040		
78	51.500	78	0.478	78	1.040		
80	51.500	80	0.478	80	1.040		
82	51.500	82	0.478	82	1.040		
84	51.500	84	0.478	84	1.040		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		42	0.002	42	0.00004	100	0.422
		44	0.002	44	0.00004	120	0.432
		46	0.002	46	0.00005	140	0.441
		48	0.002	48	0.00005	160	0.451
		50	0.002	50	0.00005	180	0.460
		52	0.003	52	0.00006	200	0.469
		54	0.003	54	0.00006	220	0.478
		56	0.003	56	0.00007	240	0.487
		58	0.003	58	0.00008	260	0.496
		60	0.004	60	0.00008	280	0.504
		62	0.004	62	0.00009	300	0.513
		64	0.004	64	0.00010	320	0.521
		66	0.005	66	0.00011	340	0.529
		68	0.005	68	0.00011	360	0.537
		70	0.006	70	0.00012	380	0.544
		72	0.006	72	0.00013	400	0.552
		74	0.007	74	0.00015	420	0.559
		76	0.007	76	0.00016	440	0.566
		78	0.008	78	0.00017		
		80	0.008	80	0.00018		
		82	0.009	82	0.00020		
		84	0.010	84	0.00022		

# ISOPROPYL ALCOHOL

IPA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dimethylcarbinol Isopropanol Petrohol 2-Propanol sec-Propyl alcohol Rubbing alcohol	Watery liquid	Colorless	Unpleasant alcohol odor like rubbing alcohol
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b>			
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to eyes. Harmful if swallowed. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$   
2.3 IMO/UN Designation: 3.2/1219  
2.4 DOT ID No.: 1219  
2.5 CAS Registry No.: 67-63-0  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51212

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor canister or air-supplied mask; chemical goggles or face splash shield.  
3.2 **Symptoms Following Exposure:** Vapors cause mild irritation of eyes and upper respiratory tract; high concentrations may be anesthetic. Liquid irritates eyes and may cause injury; harmless to skin; if ingested causes drunkenness and vomiting.  
3.3 **Treatment of Exposure:** INHALATION: if victim is overcome by vapors, remove from exposure immediately; call a physician; if breathing is irregular or has stopped, start resuscitation and administer oxygen. EYES: flush with water for at least 15 min.  
3.4 **TLV-TWA:** 400 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 500 ppm.  
3.7 **Toxicity by Ingestion:** Grade 1;  $\text{LD}_{50}$  = 5 to 15 g/kg (rat);  $\text{LD}_{50}$ : 5.84 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** 90 mg/m<sup>3</sup>  
3.13 **IDLH Value:** 2,000 ppm  
3.14 **OSHA PEL-TWA:** 400 ppm.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 65°F O.C. 53°F C.C.  
4.2 **Flammable Limits in Air:** 2.3%-12.7%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 750°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 2.3 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 12.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 900-1100 ppm/24 hr/chub/critical range/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 133%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 91%, 95% Anhydrous  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 60.10  
9.3 **Boiling Point at 1 atm:** 180.1°F = 82.3°C = 355.5°K  
9.4 **Freezing Point:** -127.3°F = -88.5°C = 184.7°K  
9.5 **Critical Temperature:** 455.4°F = 235.2°C = 508.4°K  
9.6 **Critical Pressure:** 691 psia = 47.0 atm = 4.76 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.785 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.1  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.105  
9.12 **Latent Heat of Vaporization:** 286 Btu/lb = 159 cal/g = 6.66 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -12,960 Btu/lb = -7,201 cal/g = -301.5 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 21.37 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 1.4 psia

### NOTES

## ISOPROPYL ALCOHOL

IPA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	49.940	15	0.525	45	0.956	N O T  P E R T I N E N T	
36	49.890	20	0.533	50	0.952		
38	49.830	25	0.540	55	0.949		
40	49.780	30	0.547	60	0.945		
42	49.720	35	0.554	65	0.941		
44	49.660	40	0.561	70	0.937		
46	49.610	45	0.569	75	0.933		
48	49.550	50	0.576	80	0.929		
50	49.500	55	0.583	85	0.925		
52	49.440	60	0.590	90	0.921		
54	49.380	65	0.598	95	0.917		
56	49.330	70	0.605	100	0.914		
58	49.270	75	0.612	105	0.910		
60	49.210	80	0.619	110	0.906		
62	49.160	85	0.626	115	0.902		
64	49.100						
66	49.050						
68	48.990						
70	48.930						
72	48.880						
74	48.820						
76	48.760						
78	48.710						
80	48.650						
82	48.600						
84	48.540						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		40	0.223	40	0.00250	0	0.312
		50	0.328	50	0.00361	25	0.325
		60	0.476	60	0.00513	50	0.339
		70	0.678	70	0.00717	75	0.352
		80	0.953	80	0.00988	100	0.365
		90	1.319	90	0.01343	125	0.378
		100	1.801	100	0.01802	150	0.390
		110	2.429	110	0.02387	175	0.403
		120	3.237	120	0.03126	200	0.416
		130	4.266	130	0.04050	225	0.428
		140	5.563	140	0.05194	250	0.440
		150	7.183	150	0.06596	275	0.453
		160	9.188	160	0.08302	300	0.465
		170	11.650	170	0.10360	325	0.477
		180	14.650	180	0.12820	350	0.489
		190	18.270	190	0.15740	375	0.500
		200	22.610	200	0.19190	400	0.512
		210	27.790	210	0.23240	425	0.524
						450	0.535
						475	0.546
						500	0.557
						525	0.568
						550	0.579
						575	0.590
						600	0.601



# ISOPROPYL PERCARBONATE

IPC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diisopropyl percarbonate Diisopropyl peroxydicarbonate Isopropyl peroxydicarbonate bis-(1-Methylethyl) ester Peroxydicarbonic acid,	Solid (Packed in Dry Ice)      White      Sharp Unpleasant Odor  Sinks in water. Freezing point is 48°F.
Keep people away. Shut off ignition sources. Call fire department. Avoid contact with solid and dust. Notify local health and pollution control agencies.	
<b>Fire</b>	COMBUSTIBLE. May cause fire on contact with combustibles. Will increase the intensity of a fire. Containers may explode in fire. DO NOT USE DRY CHEMICALS, CARBON DIOXIDE, OR FOAM ON FIRE. Flood discharge area with water from safe distance or protected location. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim; Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>3</sub> H <sub>7</sub> OOCCOCCOOC <sub>3</sub> H <sub>7</sub> 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 105-64-6 2.6 NAERG Guide No.: 148 2.7 Standard Industrial Trade Classification: 51699
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Rubber gloves and shoes; hard hat; chemical splash goggles; plastic apron; respirator (depending on solvent used) 3.2 <b>Symptoms Following Exposure:</b> Inhalation overexposure unlikely, but prolonged exposure may cause lung edema. Contact with eyes may cause irritation. Solutions are severe primary skin irritants. 3.3 <b>Treatment of Exposure:</b> INHALATION: move to uncontaminated atmosphere; if breathing is difficult, give oxygen. EYES: flush with copious amounts of water. SKIN: wash off with isopropyl alcohol and water; call a physician. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5-5 g/kg 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEG1: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent (combustible solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** All extinguishing agents may be ineffective.  
4.5 **Special Hazards of Combustion**  
**Products:** Flammable and/or toxic gases formed in fires include acetone, isopropyl alcohol, acetaldehyde, and ethane.  
4.6 **Behavior in Fire:** Undergoes auto-accelerative decomposition and may self-ignite. Confinement may lead to detonation. Fires very difficult to extinguish because air not needed  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May decompose with formation of oxygen when in contact with metals  
5.3 **Stability During Transport:** Unstable above 0°F with formation of oxygen gas  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 98.5-99+%  
7.2 **Storage Temperature:** Below -18°C (0°F)  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 206.2  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** 46–50°F = 8–10°C = 281–283°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.08 at 15°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** –8,500 Btu/lb = –4,720 cal/g = –198 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** –670 Btu/lb = –370 cal/g = 15.5 X 10<sup>3</sup> J/kg  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# ISOPROPYL PERCARBONATE

IPC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
59	67.419		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.040		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ISOPHORONE DIISOCYANATE

IPD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> IPDI Isophorone diamine diisocyanate		Liquid  Colorless or yellowish  Sinks and reacts with water to produce carbon dioxide and the diamine.
Keep people away. Avoid contact with liquid and vapor. Wear positive pressure breathing apparatus and special chemical protective suit. Call fire department. Shut off ignition sources. Notify local health and pollution control agencies.		
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear positive pressure breathing apparatus and special chemical protective suit. Extinguish small fires with dry chemical, CO <sub>2</sub> , water spray or foam; large fires with water spray, fog or foam. (It reacts with water to produce carbon dioxide and the corresponding diamine.)	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS. MAY BE FATAL IF INHALED OR ABSORBED THROUGH SKIN. Contact may cause burns to skin and eyes. Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS. MAY BE FATAL IF SWALLOWED OR ABSORBED THROUGH SKIN. Contact may burn skin and eyes. Immediately flush skin or eyes with running water for at least 15 minutes. Hold eyelids open periodically while flushing eyes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 12; Isocyanates
- 2.2 Formula: C<sub>12</sub>H<sub>18</sub>N<sub>2</sub>O<sub>2</sub>
- 2.3 IMO/UN Designation: 6.1/2290
- 2.4 DOT ID No.: 2290
- 2.5 CAS Registry No.: 4098-71-9
- 2.6 NAERG Guide No.: 156
- 2.7 Standard Industrial Trade Classification: 51489

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear positive pressure breathing apparatus and special protective clothing.
- 3.2 **Symptoms Following Exposure:** Poisonous. May be fatal if inhaled, swallowed or absorbed through skin. Contact may cause burns to skin and eyes.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Immediately flush eyes with running water for at least 15 minutes; hold eyelids open periodically. SKIN: Immediately flush skin with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. INGESTION: If victim is unconscious or having convulsions, do nothing but keep him quiet and maintain normal body temperature.
- 3.4 TLV-TWA: 0.005 ppm.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> > 2.6 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small Fires: Dry chemical, CO<sub>2</sub>, water spray or foam. Large Fires: Water spray, fog or foam. (Reacts with water to produce gaseous carbon dioxide and the corresponding diamine.)
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Although water is suitable for extinguishing open air fires, it should not be allowed to contaminate closed tanks containing this material due to the risk of hazardous gas generation.
- 4.5 **Special Hazards of Combustion Products:** Contain toxic fumes of NO<sub>x</sub>.
- 4.6 **Behavior in Fire:** Undergoes oxidation to produce toxic fumes containing NO<sub>x</sub>.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 83.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 23.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with water to produce water-soluble isophorone diamine (a toxic and corrosive compound) and carbon dioxide.
- 5.2 **Reactivity with Common Materials:** Contact with aluminum, aluminum alloys, copper or copper alloys is prohibited.
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Not listed
- 7.3 **Inert Atmosphere:** Inerted
- 7.4 **Venting:** Pressure-Vacuum
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 222.32
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** -76°F = -60°C = 213°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.056 to 1.062 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 7.7 (calculated)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISOPHORONE DIISOCYANATE

IPD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	66.100		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# ISOPROPYL ETHER

IPE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diisopropyl ether Diisopropyl oxide 2-Isopropoxy propane	Liquid  Colorless  Sweet odor  Floats and mixes slowly with water. Flammable, irritating vapor is produced
Evacuate. Keep people away. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Containers may explode on fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, or nausea. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 41; Ethers  
2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>CHOCH(CH<sub>3</sub>)<sub>2</sub>  
2.3 IMO/UN Designation: 3.1/1159  
2.4 DOT ID No.: 1159  
2.5 CAS Registry No.: 108-20-3  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air pack or organic canister mask; rubber gloves; goggles.  
3.2 **Symptoms Following Exposure:** Inhalation causes anesthesia, nausea, headache, dizziness, and irritation of the eyes and nose. Contact of liquid with eyes causes only minor injury; repeated contact with skin will remove natural oils and may cause dermatitis.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air and obtain medical attention immediately; keep him warm and at rest, and give artificial respiration if breathing stops; maintain an open airway. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; oral LD<sub>50</sub> = 8,470 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
-15°F O.C., • -18°F C.C.  
4.2 **Flammable Limits in Air:** 1.4%-7.9%  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. Containers may explode when heated.  
4.7 **Auto Ignition Temperature:** 830°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 5.0 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 10.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Unstable peroxides may form on long standing in contact with air; these may explode spontaneously or when heated.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 94+% May contain 0.01% hydroquinone or other inhibitor to prevent peroxide formation.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 102.2  
9.3 **Boiling Point at 1 atm:** 156°F = 69°C = 342°K  
9.4 **Freezing Point:** -123°F = -86°C = 187°K  
9.5 **Critical Temperature:** 440.4°F = 226.9°C = 500.1°K  
9.6 **Critical Pressure:** 418 psia = 28.4 atm = 2.88 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.724 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 17.1 dynes/cm = 0.0171 N/m at 25°C  
9.9 **Liquid Water Interfacial Tension:** 17.1 dynes/cm = 0.0171 N/m at 25°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0590  
9.12 **Latent Heat of Vaporization:** 131 Btu/lb = 73 cal/g = 3.1 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -16,900 Btu/lb = -9,390 cal/g = -393 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 25.79 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** High

### NOTES

# ISOPROPYL ETHER

IPE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	46.450	0	0.476	42	1.048	28	0.589
40	46.260	5	0.478	44	1.048	30	0.577
45	46.070	10	0.480	46	1.048	32	0.566
50	45.880	15	0.482	48	1.048	34	0.555
55	45.690	20	0.485	50	1.048	36	0.545
60	45.500	25	0.487	52	1.048	38	0.534
65	45.310	30	0.489	54	1.048	40	0.524
70	45.120	35	0.491	56	1.048	42	0.515
75	44.930	40	0.494	58	1.048	44	0.505
80	44.740	45	0.496	60	1.048	46	0.496
85	44.540	50	0.498	62	1.048	48	0.487
90	44.350	55	0.500	64	1.048	50	0.478
95	44.160	60	0.502	66	1.048	52	0.470
100	43.970	65	0.505	68	1.048	54	0.461
105	43.780	70	0.507	70	1.048	56	0.453
110	43.590	75	0.509	72	1.048	58	0.445
115	43.400	80	0.511	74	1.048	60	0.437
120	43.210	85	0.514	76	1.048	62	0.430
125	43.020					64	0.423
130	42.830					66	0.415
135	42.640					68	0.408
140	42.450					70	0.402
						72	0.395
						74	0.388
						76	0.382
						78	0.376

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.200	35	0.975	35	0.01876	0	0.310
		40	1.119	40	0.02132	20	0.321
		45	1.281	45	0.02416	40	0.333
		50	1.462	50	0.02732	60	0.344
		55	1.665	55	0.03081	80	0.355
		60	1.892	60	0.03466	100	0.366
		65	2.144	65	0.03891	120	0.377
		70	2.424	70	0.04357	140	0.388
		75	2.734	75	0.04869	160	0.398
		80	3.077	80	0.05429	180	0.409
		85	3.456	85	0.06041	200	0.419
		90	3.873	90	0.06708	220	0.428
		95	4.331	95	0.07434	240	0.438
		100	4.834	100	0.08223	260	0.448
		105	5.385	105	0.09079	280	0.457
		110	5.987	110	0.10010	300	0.466
		115	6.644	115	0.11010	320	0.475
		120	7.361	120	0.12090	340	0.484
		125	8.140	125	0.13250	360	0.492
		130	8.986	130	0.14510	380	0.501
		135	9.904	135	0.15860	400	0.509
		140	10.900	140	0.17300	420	0.517
		145	11.970	145	0.18850	440	0.525
		150	13.130	150	0.20510		
		155	14.380	155	0.22280		

# ISOPHORONE

IPH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 3,5,5-Trimethyl-2-cyclohexane-1-one			
Liquid	Colorless	Camphor-like odor	
Floats and mixes slowly with water.			
Keep people away. Call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.		
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Chemical and Physical Treatment: Absorb Clean shore line	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 18; Ketone 2.2 Formula: COCH=C(CH <sub>3</sub> )CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> CH <sub>3</sub> 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 78-59-1 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51628
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus with full face mask; rubber gloves 3.2 <b>Symptoms Following Exposure:</b> Inhalation irritates eye, nose and throat; causes central depression and has some anesthetic effect. Contact of liquid with eyes causes severe irritation and possible tissue damage. Skin is irritated by liquid and may crack on prolonged contact. Ingestion causes irritation of mouth and stomach. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove victim promptly from contaminated atmosphere; if breathing has stopped, give artificial respiration and oxygen. EYES: flood with water for at least 15 min.; consult an eye specialist as soon as possible. SKIN: flood with water. INGESTION: do NOT induce vomiting; call a doctor. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> 5 ppm. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; oral LD <sub>50</sub> = 2,330 mg/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 3.11 <b>Liquid or Solid Characteristics:</b> Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 200 ppm. 3.14 <b>OSHA PEL-TWA:</b> 25 ppm. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 205°F O.C. 184°F C.C.  
4.2 **Flammable Limits in Air:** 0.84%-3.8%  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 864°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 4.0 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 430 ppm/24 hr/brine shrimp/TL<sub>m</sub>  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 138.2  
9.3 **Boiling Point at 1 atm:** 419.5°F = 215.3°C = 488.5°K  
9.4 **Freezing Point:** 17.4°F = -8.1°C = 265.1°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.921 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** 32.3 dynes/cm = 0.0323 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 4.75  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 135 Btu/lb = 75 cal/g = 3.14 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -16,170 Btu/lb = -8,980 cal/g = -376 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

## NOTES

# ISOPHORONE

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
65	57.580	65	0.454	42	1.048	65	2.855
70	57.470	70	0.454	44	1.048	70	2.682
75	57.360	75	0.455	46	1.048	75	2.522
80	57.250	80	0.455	48	1.048	80	2.374
85	57.140	85	0.455	50	1.048	85	2.238
90	57.020	90	0.455	52	1.048	90	2.112
95	56.900	95	0.456	54	1.048	95	1.995
100	56.770	100	0.456	56	1.048	100	1.886
105	56.640	105	0.456	58	1.048	105	1.785
110	56.510	110	0.457	60	1.048	110	1.691
115	56.380	115	0.457	62	1.048	115	1.604
120	56.240	120	0.457	64	1.048	120	1.522
125	56.100	125	0.457	66	1.048	125	1.446
		130	0.458	68	1.048		
				70	1.048		
				72	1.048		
				74	1.048		
				76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	1.483	150	0.065	150	0.00138	0	0.271
36	1.467	160	0.088	160	0.00182	20	0.283
38	1.450	170	0.117	170	0.00238	40	0.296
40	1.433	180	0.154	180	0.00309	60	0.308
42	1.417	190	0.201	190	0.00398	80	0.320
44	1.400	200	0.260	200	0.00507	100	0.332
46	1.383	210	0.334	210	0.00642	120	0.343
48	1.367	220	0.426	220	0.00807	140	0.355
50	1.350	230	0.540	230	0.01008	160	0.366
52	1.333	240	0.680	240	0.01251	180	0.377
54	1.317	250	0.850	250	0.01542	200	0.388
56	1.300	260	1.056	260	0.01889	220	0.398
58	1.283	270	1.304	270	0.02301	240	0.409
60	1.267	280	1.602	280	0.02788	260	0.419
62	1.250	290	1.957	290	0.03360	280	0.429
64	1.233	300	2.377	300	0.04029	300	0.439
66	1.217					320	0.449
68	1.200					340	0.458
70	1.183					360	0.467
72	1.167					380	0.476
74	1.150					400	0.485
76	1.133					420	0.494
78	1.117					440	0.503
80	1.100						
82	1.083						
84	1.067						



# ISOPHORONE DIAMINE

IPI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 3-Aminomethyl-3,5,5-trimethylcyclohexylamine	Liquid  Colorless  Faint amine odor  Floats and mixes with water. Freezing point is 50°F.
Keep people away. Avoid contact with liquid and vapor. Wear goggles, rubber overclothing and gloves, and a mask with an ammonia type filter. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, dry chemical, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR If inhaled, may cause irritation, coughing, and nausea. Move to fresh air. If breathing has stopped, give artificial respiration.  LIQUID May cause inflammation/burns to eyes and skin. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Collection Systems: Dredge Chemical and Physical Treatment: Neutralize	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> T; Aliphatic amines <b>2.2 Formula:</b> (CH <sub>3</sub> ) <sub>3</sub> C <sub>6</sub> H <sub>11</sub> (NH <sub>2</sub> )CH <sub>2</sub> NH <sub>2</sub> <b>2.3 IMO/UN Designation:</b> 8/2289 <b>2.4 DOT ID No.:</b> 2289 <b>2.5 CAS Registry No.:</b> 2855-13-2 <b>2.6 NAERG Guide No.:</b> 153 <b>2.7 Standard Industrial Trade Classification:</b> 51453
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Wear rubber overclothing, gloves, goggles, and self-contained breathing apparatus. <b>3.2 Symptoms Following Exposure:</b> Inhalation of high concentrations of vapor causes irritation, coughing, and nausea. Eyes: May cause inflammation/burns. Skin: May cause burns. Ingestion: Nausea. <b>3.3 Treatment of Exposure:</b> INHALATION: Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Immediately flush with running water for at least 15 minutes; hold eyelids open if appropriate. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. INGESTION: If swallowed and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 1.03 g/kg (rat) <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Currently not available <b>3.11 Liquid or Solid Characteristics:</b> Currently not available <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 230°F O.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; Large fires: water spray, fog or foam.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion Products:** Currently not available  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 83.3 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 23.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** Corrodes aluminum and steel in the presence of moisture and carbon dioxide.  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Flush with water.  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 99.7%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** D  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Corrosive material  
**8.2 49 CFR Class:** 8  
**8.3 49 CFR Package Group:** III  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 170.3  
**9.3 Boiling Point at 1 atm:** 477°F = 247°C = 520°K  
**9.4 Freezing Point:** 50°F = 10°C = 283°K  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 0.924 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** 34.7 dynes/cm = 0.0347 N/m at 23°C  
**9.9 Liquid Water Interfacial Tension:** 37.62 dynes/cm = 0.0376 N/m at 23°C  
**9.10 Vapor (Gas) Specific Gravity:** Currently not available  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# ISOPHORONE DIAMINE

IPI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	57.700		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	68	18.200

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	68	0.003		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# ISOPHTHALIC ACID

IPL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzene-1,3-dicarboxylic acid m-Phthalic acid	Solid  White  Slight unpleasant odor  Sinks in water.
Keep people away. Avoid contact with solid and dust. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Dust cloud may explode if ignited in an enclosed area. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 1,3-C<sub>6</sub>H<sub>4</sub>(COOH)<sub>2</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 121-91-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** If without adequate ventilation, use respirator with dust filter, goggles, and gloves  
3.2 **Symptoms Following Exposure:** May cause slight to moderate irritation of eyes, skin, and mucous membranes on prolonged contact. Ingestion may cause gastrointestinal irritation.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to uncontaminated area; get medical attention if complications arise. INGESTION: get medical attention if complications arise. EYES: flush with large amounts of water for 15 min.; get prompt medical attention. SKIN: wash with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 12.2 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, dry powder, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Dust forms explosive mixture in air.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 82-95%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Inerted  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 166  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** 653°F = 345°C = 618°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.54 at 25°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -8,340 Btu/lb = -4,630 cal/g = -194 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISOPHTHALIC ACID

IPL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ISOPROPYL MERCAPTAN

IPM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Propane-2-thiol 2-Propanethiol	Liquid	White	Strong Skunk Odor
Floats and mixes with water. Flammable, irritating vapor is produced.			
Evacuate. Restrict human use; farm use; industrial use. Keep people away. Shut off ignition sources. Call fire department. Avoid contact with liquid and vapor. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies.			
<b>Fire</b>	FLAMMABLE. Irritating gases may be produced when heated. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing, or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>CHSH  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2402  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Inhalation causes loss of sense of smell, muscular weakness, convulsions, respiratory paralysis. Ingestion causes nausea and vomiting. Contact with eyes or skin causes irritation.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; start artificial respiration and give oxygen if required; observe for signs of pulmonary edema; get medical attention. INGESTION: give large amount of water and induce vomiting. EYES or SKIN: flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 1,790 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** 0.25 ppb  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -30°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Irritating sulfur dioxide gas is formed in fire.  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: -  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 98.0+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 76.2  
9.3 **Boiling Point at 1 atm:** 126.6°F = 52.5°C = 325.8°K  
9.4 **Freezing Point:** -202.8°F = -130.5°C = 142.7°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.814 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 22.0 dynes/cm = 0.022 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.6  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0964 at 15.6°C  
9.12 **Latent Heat of Vaporization:** 165.7 Btu/lb = 92.1 cal/g = 3.83 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -14,920 Btu/lb = -8,290 cal/g = -347 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISOPROPYL MERCAPTAN

IPM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	51.990	-140	0.387	0	1.048	52	4.059
36	51.920	-130	0.388	5	1.048	54	4.008
38	51.850	-120	0.390	10	1.048	56	3.959
40	51.780	-110	0.392	15	1.048	58	3.911
42	51.710	-100	0.394	20	1.048	60	3.863
44	51.640	-90	0.396	25	1.048	62	3.817
46	51.570	-80	0.398	30	1.048	64	3.771
48	51.510	-70	0.400	35	1.048	66	3.727
50	51.440	-60	0.402	40	1.048	68	3.683
52	51.370	-50	0.404	45	1.048	70	3.640
54	51.300	-40	0.406	50	1.048	72	3.598
56	51.230	-30	0.408	55	1.048	74	3.556
58	51.160	-20	0.410	60	1.048	76	3.516
60	51.090	-10	0.412	65	1.048	78	3.476
62	51.020	0	0.414			80	3.437
64	50.950	10	0.416			82	3.398
66	50.880	20	0.418			84	3.361
68	50.810	30	0.420			86	3.324
70	50.740	40	0.422			88	3.288
72	50.670	50	0.423			90	3.252
74	50.600	60	0.425			92	3.217
76	50.530	70	0.427			94	3.183
78	50.460	80	0.429				
80	50.400	90	0.431				
82	50.330	100	0.433				
84	50.260	110	0.435				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	45	2.446	45	0.03441	100	0.311
	I	50	2.775	50	0.03865	120	0.318
	S	55	3.140	55	0.04331	140	0.325
	C	60	3.545	60	0.04842	160	0.333
	I	65	3.993	65	0.05402	180	0.340
	B	70	4.487	70	0.06013	200	0.347
	L	75	5.031	75	0.06680	220	0.354
	E	80	5.629	80	0.07405	240	0.362
		85	6.286	85	0.08192	260	0.369
		90	7.005	90	0.09046	280	0.376
		95	7.791	95	0.09971	300	0.384
		100	8.649	100	0.10970	320	0.391
		105	9.583	105	0.12050	340	0.398
		110	10.600	110	0.13210	360	0.405
		115	11.700	115	0.14460	380	0.413
		120	12.900	120	0.15800	400	0.420
		125	14.190	125	0.17230	420	0.427
						440	0.435

# ISOPROPYLAMINE

IPP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Aminopropane Monoisopropylamine iso-Propylamine	Liquid  Colorless  Strong ammonia odor
Floats and mixes with water. Flammable, irritating vapor is produced. Boiling point is 91°F.	
Evacuate. Restrict human use; farm use; industrial use. Keep people away. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing, difficult breathing or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 7; Aliphatic amine  
2.2 **Formula:** (CH<sub>3</sub>)<sub>2</sub>CHNH<sub>2</sub>  
2.3 **IMO/UN Designation:** 3.1/1221  
2.4 **DOT ID No.:** 1221  
2.5 **CAS Registry No.:** 75-31-0  
2.6 **NAERG Guide No.:** 132  
2.7 **Standard Industrial Trade Classification:** 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; butyl rubber gloves and apron; chemical face shield or safety goggles
- 3.2 **Symptoms Following Exposure:** Inhalation causes nose and throat irritation, severe coughing, and chest pain due to irritation of air passages; can cause lung edema and loss of consciousness. Ingestion causes nausea, salivation and severe irritation of mouth and stomach. Contact with eyes causes severe irritation and possible edema of the cornea. Contact with skin causes severe irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if he is not breathing, give artificial respiration; if breathing is difficult, give oxygen; call a physician. INGESTION: call a physician immediately; encourage the drinking of large quantities of water followed by dilute vinegar, lemon juice, cider, or other weak acids; keep patient warm. EYES: flush with water for 15 min., holding eyelids apart; call physician as soon as possible, preferably an eye specialist. SKIN: flush with water.
- 3.4 **TLV-TWA:** 5 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 10 ppm.  
3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 820 mg/kg (rat), 600 mg/kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating, such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** 5 ppm  
3.13 **IDLH Value:** 750 ppm  
3.14 **OSHA PEL-TWA:** 5 ppm.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -15°F O.C.  
4.2 **Flammable Limits in Air:** 2.3%-12%  
4.3 **Fire Extinguishing Agents:** Dry chemical, "alcohol" foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.  
4.6 **Behavior in Fire:** Burning isopropylamine is difficult to control because of the ease of reignition of the vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Containers may explode.  
4.7 **Auto Ignition Temperature:** 756°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 6.33 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 29.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.3 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 40-80 ppm/24 hr/creek chub/critical range/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 99.0%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 4              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 59.11  
9.3 **Boiling Point at 1 atm:** 90.3°F = 32.4°C = 305.6°K  
9.4 **Freezing Point:** -139°F = -95°C = 178°K  
9.5 **Critical Temperature:** 395.6°F = 202°C = 475.2°K  
9.6 **Critical Pressure:** 740 psia = 50 atm = 5.1 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** (est.) 0.691 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 16.8 dynes/cm = 0.0168 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.04  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 193 Btu/lb = 107 cal/g = 4.48 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -16,940 Btu/lb = -9,420 cal/g = -394 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -210 Btu/lb = -110 cal/g = -4.8 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 18.2 psia

### NOTES

# ISOPROPYLAMINE

IPP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	43.660	50	0.640	50	0.908	77	0.360
44	43.590	51	0.640	51	0.908		
46	43.520	52	0.640	52	0.908		
48	43.450	53	0.640	53	0.908		
50	43.380	54	0.640	54	0.908		
52	43.310	55	0.640	55	0.908		
54	43.240	56	0.640	56	0.908		
56	43.180	57	0.640	57	0.908		
58	43.110	58	0.640	58	0.908		
60	43.040	59	0.640	59	0.908		
62	42.970	60	0.640	60	0.908		
64	42.900	61	0.640	61	0.908		
66	42.830	62	0.640	62	0.908		
68	42.760	63	0.640	63	0.908		
70	42.690	64	0.640	64	0.908		
72	42.620	65	0.640	65	0.908		
74	42.550	66	0.640	66	0.908		
76	42.480	67	0.640	67	0.908		
78	42.410	68	0.640	68	0.908		
80	42.340	69	0.640	69	0.908		
82	42.270	70	0.640	70	0.908		
84	42.200	71	0.640	71	0.908		
86	42.130	72	0.640	72	0.908		
		73	0.640	73	0.908		
		74	0.640	74	0.908		
		75	0.640	75	0.908		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		-60	0.187	-60	0.00258	0	0.355
		-50	0.283	-50	0.00380	25	0.370
		-40	0.418	-40	0.00548	50	0.385
		-30	0.603	-30	0.00773	75	0.400
		-20	0.853	-20	0.01068	100	0.414
		-10	1.184	-10	0.01450	125	0.429
		0	1.615	0	0.01935	150	0.443
		10	2.169	10	0.02543	175	0.457
		20	2.870	20	0.03294	200	0.470
		30	3.745	30	0.04212	225	0.484
		40	4.827	40	0.05320	250	0.497
		50	6.148	50	0.06642	275	0.510
		60	7.745	60	0.08207	300	0.522
		70	9.657	70	0.10040	325	0.535
		80	11.930	80	0.12170	350	0.547
		90	14.600	90	0.14620	375	0.559
		100	17.720	100	0.17430	400	0.571
		110	21.330	110	0.20620	425	0.583
		120	25.500	120	0.24220	450	0.594
		130	30.260	130	0.28260	475	0.605
		140	35.680	140	0.32770	500	0.616
						525	0.627
						550	0.637
						575	0.647
						600	0.657



# ISOPRENE

IPR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> beta-Methylbiviny 2-Methyl-1, 3-butadiene			
Watery liquid	Colorless	Mild odor	
Floats on water. Flammable, irritating vapor is formed. Boiling point is 93°F.			
Evacuate. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.			
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Containers may explode in fire. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Combat fires from behind barrier or protected location. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $\text{CH}_2=\text{C}(\text{CH}_3)\text{CH}=\text{CH}_2$   
2.3 IMO/UN Designation: 3.1/1218  
2.4 DOT ID No.: 1218  
2.5 CAS Registry No.: 78-79-5  
2.6 NAERG Guide No.: 130P  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Vapor-proof goggles; self-contained breathing apparatus; leather or rubber safety shoes; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Vapor produces no effects other than slight irritation of the eyes and upper respiratory tract. Liquid may irritate eyes; like gasoline.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim promptly from irritating or asphyxiating atmosphere; if symptoms of asphyxiation persist, administer artificial respiration and oxygen; treat symptomatically thereafter; call a physician. EYES: flush with water for at least 15 min.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 0.005 ppm
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -65°F C.C.
- 4.2 **Flammable Limits in Air:** 2%-9%
- 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective
- 4.5 **Special Hazards of Combustion Products:** Toxic vapors are generated when heated
- 4.6 **Behavior in Fire:** May polymerize in containers and explode
- 4.7 **Auto Ignition Temperature:** 743°F
- 4.8 **Electrical Hazards:** Class I, Group C
- 4.9 **Burning Rate:** 8.6 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Polymerization is accelerated by heat and by oxygen, even by the presence of rusty iron. Iron surfaces should be treated with a suitable reducing agent, such as sodium nitrite, before they are placed into isoprene service.
- 5.6 **Inhibitor of Polymerization:** Tertiary butyl catechol (0.06%). Di-n-butylamine, phenyl-beta-naphthyl- amine and phenyl-alpha-naphthylamine are also used. IPR must be inhibited when transported interstate

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 75 ppm/96 hr/fathead minnow/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 0  
Human Contact hazard: 1  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research grade: 99.99%; polymerization grade: 99.8%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid
- 8.2 49 CFR Class: 3
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 4              |
| Instability (Yellow)..... | 2              |
- 8.6 EPA Reportable Quantity: 100 pounds
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCL List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 68.12
- 9.3 **Boiling Point at 1 atm:** 93.4°F = 34.1°C = 307.3°K
- 9.4 **Freezing Point:** -230.7°F = -145.9°C = 127.3°K
- 9.5 **Critical Temperature:** 412.0°F = 211.1°C = 484.3°K
- 9.6 **Critical Pressure:** 550 psia = 37.4 atm = 3.79 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.681 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 16.9 dynes/cm = 0.0169 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** 2.3
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.091
- 9.12 **Latent Heat of Vaporization:** 150 Btu/lb = 85 cal/g = 3.6 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -18,848 Btu/lb = -10,471 cal/g = -438.40 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** -499 Btu/lb = -277 cal/g = -11.6 X 10<sup>5</sup> J/kg
- 9.17 **Heat of Fusion:** 16.80 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 15.0 psia

### NOTES

# ISOPRENE

IPR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	45.280	0	0.499	-180	1.225	-20	0.370
10	44.860	5	0.501	-170	1.210	-15	0.356
20	44.450	10	0.504	-160	1.195	-10	0.343
30	44.030	15	0.506	-150	1.179	-5	0.331
40	43.610	20	0.509	-140	1.164	0	0.319
50	43.200	25	0.511	-130	1.148	5	0.308
60	42.780	30	0.514	-120	1.133	10	0.298
70	42.360	35	0.516	-110	1.117	15	0.288
80	41.950	40	0.519	-100	1.102	20	0.279
90	41.530	45	0.521	-90	1.087	25	0.270
		50	0.524	-80	1.071	30	0.262
		55	0.526	-70	1.056	35	0.254
		60	0.529	-60	1.040	40	0.246
		65	0.531	-50	1.025	45	0.239
		70	0.534	-40	1.010	50	0.232
		75	0.536	-30	0.994	55	0.226
		80	0.539	-20	0.979	60	0.219
		85	0.541	-10	0.963	65	0.214
		90	0.544	0	0.948	70	0.208
				10	0.933	75	0.202
				20	0.917	80	0.197
				30	0.902	85	0.192
				40	0.886		
				50	0.871		
				60	0.856		
				70	0.840		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	-70	0.131	-70	0.00213	0	0.313
	N	-60	0.200	-60	0.00317	25	0.327
	S	-50	0.298	-50	0.00461	50	0.341
	O	-40	0.433	-40	0.00655	75	0.354
	L	-30	0.618	-30	0.00913	100	0.367
	U	-20	0.864	-20	0.01247	125	0.380
	B	-10	1.188	-10	0.01676	150	0.393
	L	0	1.606	0	0.02217	175	0.405
	E	10	2.139	10	0.02890	200	0.418
		20	2.809	20	0.03716	225	0.430
		30	3.642	30	0.04720	250	0.441
		40	4.665	40	0.05925	275	0.453
		50	5.909	50	0.07357	300	0.464
		60	7.406	60	0.09044	325	0.475
		70	9.192	70	0.11010	350	0.486
		80	11.300	80	0.13290	375	0.497
						400	0.507
						425	0.517
						450	0.527
						475	0.537
						500	0.547
						525	0.556
						550	0.565
						575	0.574
						600	0.583

## ISOPENTANE

IPT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Methylbutane	Watery liquid	Colorless	Gasoline-like odor
Floats on water. Flammable, irritating vapor is produced. Boiling point is 82°F.			
Evacuate. Keep people away. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.			
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers and protect men effecting shutoff with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to nose and throat. If inhaled, will cause coughing, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 31; Paraffin  
2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>CHCH<sub>2</sub>CH<sub>3</sub>  
2.3 IMO/UN Designation: 3.1/1265  
2.4 DOT ID No.: 1265  
2.5 CAS Registry No.: 78-78-4  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51114

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Eye protection (as for gasoline)
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory tract, cough, mild depression, irregular heartbeat. Aspiration causes severe lung irritation, coughing, pulmonary edema; excitement followed by depression. Ingestion causes nausea, vomiting, swelling of abdomen, headache, depression.
- 3.3 **Treatment of Exposure:** INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest; give oxygen. INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with copious amounts of water. SKIN: wipe off, wash with soap and water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** -70°F C.C. (approx.)  
4.2 **Flammable Limits in Air:** 1.4%-8.3%  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Highly volatile liquid. Vapors may explode when mixed with air.  
4.7 **Auto Ignition Temperature:** 800°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 7.4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 12.0%; CO<sub>2</sub> diluent: 14.5%

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research: 99.99%; pure: 99.4%; technical: 97%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 72.15  
9.3 **Boiling Point at 1 atm:** 82.2°F = 27.9°C = 301.1°K  
9.4 **Freezing Point:** -255.8°F = -159.9°C = 113.3°K  
9.5 **Critical Temperature:** 369.0°F = 187.2°C = 460.4°K  
9.6 **Critical Pressure:** 491.0 psia = 33.4 atm = 3.38 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.620 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 16.05 dynes/cm = 0.01605 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 31 dynes/cm = 0.031 N/m at 22.7°C  
9.10 **Vapor (Gas) Specific Gravity:** 2.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.076  
9.12 **Latent Heat of Vaporization:** 146 Btu/lb = 81.0 cal/g = 3.39 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -19,314 Btu/lb = -10,730 cal/g = -449.24 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 17.05 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 20 psia

## NOTES

# ISOPENTANE

IPT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-20	41.660	0	0.502	46	0.823	-20	0.399
-15	41.490	5	0.505	48	0.821	-15	0.384
-10	41.320	10	0.508	50	0.818	-10	0.370
-5	41.150	15	0.510	52	0.816	-5	0.356
0	40.980	20	0.513	54	0.814	0	0.344
5	40.810	25	0.516	56	0.811	5	0.332
10	40.640	30	0.519	58	0.809	10	0.320
15	40.470	35	0.522	60	0.806	15	0.310
20	40.300	40	0.524	62	0.804	20	0.300
25	40.130	45	0.527	64	0.802	25	0.290
30	39.960	50	0.530	66	0.799	30	0.281
35	39.790	55	0.533	68	0.797	35	0.273
40	39.620	60	0.535	70	0.794	40	0.264
45	39.450	65	0.538	72	0.792	45	0.257
50	39.280	70	0.541	74	0.790	50	0.249
55	39.110	75	0.544	76	0.787	55	0.242
60	38.940	80	0.547	78	0.785	60	0.235
65	38.770			80	0.782	65	0.229
70	38.600			82	0.780		
75	38.430						
80	38.260						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	0	2.181	0	0.03189	0	0.344
	N	5	2.506	5	0.03625	25	0.360
	S	10	2.870	10	0.04107	50	0.376
	O	15	3.275	15	0.04638	75	0.392
	L	20	3.726	20	0.05220	100	0.408
	U	25	4.225	25	0.05859	125	0.424
	B	30	4.776	30	0.06556	150	0.439
	L	35	5.384	35	0.07315	175	0.454
	E	40	6.052	40	0.08141	200	0.469
		45	6.785	45	0.09036	225	0.484
		50	7.587	50	0.10010	250	0.499
		55	8.462	55	0.11050	275	0.513
		60	9.415	60	0.12180	300	0.528
		65	10.450	65	0.13390	325	0.542
		70	11.570	70	0.14690	350	0.556
		75	12.790	75	0.16080	375	0.569
		80	14.100	80	0.17560	400	0.583
		85	15.520	85	0.19150	425	0.596
		90	17.040	90	0.20840	450	0.609
		95	18.680	95	0.22630	475	0.622
		100	20.430	100	0.24540	500	0.635
		105	22.310	105	0.26560	525	0.648
		110	24.320	110	0.28700	550	0.660
		115	26.470	115	0.30960	575	0.672
		120	28.760	120	0.33340	600	0.685

# ISOPROPYL CYCLOHEXANE

IPX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hexahydrocumene 1-Methylethylcyclohexane Normenthane	Liquid  Colorless
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control officials.</b>	
<b>Fire</b>	COMBUSTIBLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective on fire. Extinguish with foam, dry chemicals, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause dizziness, nausea, vomiting, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>CHC<sub>6</sub>H<sub>11</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 696-29-7
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Hydrocarbon vapor canister, supplied-air, or hose mask, hydrocarbon-insoluble rubber or plastic gloves, chemical goggles or face splash shield, hydrocarbon-insoluble rubber or plastic apron.
- 3.2 **Symptoms Following Exposure:** Dizziness, with nausea and vomiting. Concentrated vapor may cause collapse and unconsciousness.
- 3.3 **Treatment of Exposure:** INHALATION: Remove victim to fresh air; if breathing stops, give artificial respiration and administer oxygen. SKIN OR EYE CONTACT: Remove contaminated clothing and gently flush affected areas with water for 15 minutes; call a physician.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 96°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may not be effective on fire
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** 541°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 64.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
TL<sub>96</sub> = 100 - 1000 ppm
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (3)  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not Listed
- 8.2 **49 CFR Class:** Not Pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	-
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 126.24
- 9.3 **Boiling Point at 1 atm:** 310°F = 154.5°C = 428°K
- 9.4 **Freezing Point:** -129°F = -89.4°C = 184°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.8023 @ 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 4.35 (est)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** (est) 20,035 Btu/lb = 11,131 cal/g = 466 X 10<sup>3</sup> J/kg
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISOPROPYL CYCLOHEXANE

IPX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	50.090		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	160 170 180 190 200 210 220 230 240 250 260 270 280 290 300	0.928 1.192 1.510 1.887 2.332 2.853 3.457 4.153 4.951 5.860 6.890 8.052 9.356 10.814 12.439		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.055 0.062 0.069 0.076 0.083 0.089 0.096 0.103 0.110 0.116 0.123 0.130 0.137 0.143 0.150 0.157 0.164 0.170 0.177 0.184 0.191 0.198 0.204 0.211 0.218

# ISODECYL ALCOHOL

ISA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Liquid	Colorless	Mild alcohol odor
	Floats on water.		
<b>Keep people away. Avoid contact with liquid. Wear goggles and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies.</b>			
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $C_{10}H_{21}OH$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51219

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Chemical goggles.  
3.2 **Symptoms Following Exposure:** Direct contact with skin can produce irritation.  
3.3 **Treatment of Exposure:** Wash affected area with water for 15 min.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 220°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemicals or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 71.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 21.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical: mixed isomers  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 158.29  
9.3 **Boiling Point at 1 atm:** 428°F = 220°C = 493°K  
9.4 **Freezing Point:** <140°F = <60°C = <333°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.841 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.032  
9.12 **Latent Heat of Vaporization:** (est.) 120 Btu/lb = 67 cal/g =  $2.8 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISODECYL ALCOHOL

ISA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	53.680	85	0.555	50	1.040	50	9.343
36	53.610	90	0.561	51	1.040	51	9.088
38	53.540	95	0.567	52	1.040	52	8.841
40	53.470	100	0.573	53	1.040	53	8.602
42	53.400	105	0.579	54	1.040	54	8.370
44	53.330	110	0.584	55	1.040	55	8.145
46	53.260	115	0.590	56	1.040	56	7.927
48	53.190	120	0.596	57	1.040	57	7.716
50	53.120	125	0.602	58	1.040	58	7.511
52	53.050	130	0.608	59	1.040	59	7.312
54	52.980	135	0.614	60	1.040	60	7.119
56	52.910	140	0.620	61	1.040	61	6.932
58	52.840	145	0.626	62	1.040	62	6.751
60	52.780	150	0.632	63	1.040	63	6.575
62	52.710			64	1.040	64	6.404
64	52.640			65	1.040	65	6.239
66	52.570			66	1.040	66	6.078
68	52.500			67	1.040	67	5.922
70	52.430			68	1.040	68	5.770
72	52.360			69	1.040	69	5.623
74	52.290			70	1.040	70	5.481
76	52.220			71	1.040	71	5.342
78	52.150			72	1.040	72	5.207
80	52.080			73	1.040	73	5.077
82	52.010			74	1.040	74	4.950
84	51.940			75	1.040	75	4.826

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.010	220	0.204	220	0.00443	100	0.416
		230	0.271	230	0.00579	120	0.426
		240	0.357	240	0.00753	140	0.436
		250	0.467	250	0.00971	160	0.445
		260	0.606	260	0.01242	180	0.455
		270	0.781	270	0.01579	200	0.464
		280	1.000	280	0.01994	220	0.473
		290	1.272	290	0.02502	240	0.482
		300	1.607	300	0.03119	260	0.491
		310	2.018	310	0.03867	280	0.499
		320	2.520	320	0.04766	300	0.507
		330	3.128	330	0.05842	320	0.516
		340	3.863	340	0.07124	340	0.524
		350	4.746	350	0.08643	360	0.531
		360	5.801	360	0.10440	380	0.539
		370	7.056	370	0.12540	400	0.547
		380	8.543	380	0.15000	420	0.554
		390	10.300	390	0.17870	440	0.561
		400	12.360	400	0.21190	460	0.568
						480	0.575
						500	0.581
						520	0.588
						540	0.594
						560	0.600
						580	0.606
						600	0.612



# O-ISOPROPYL PHENOL

ISP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Isopropyl phenol Prodox 131		Liquid Light yellow  Floats on water.
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.		
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $(\text{CH}_3)_2\text{CHC}_6\text{H}_4\text{OH}$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 88-69-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51243

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. Contact lenses should not be worn when working with this chemical. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3; oral mouse  $\text{LD}_{50}$  = 100 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 Liquid or Solid Characteristics: Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.  
3.12 Odor Threshold: Currently not available.  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 220°F O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, or carbon dioxide.  
4.4 Fire Extinguishing Agents Not to Be Used: Water.  
4.5 Special Hazards of Combustion Products: Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not listed.  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 54.7 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 15.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.  
5.5 Polymerization: Will not polymerize.  
5.6 Inhibitor of Polymerization: Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 98%; technical.  
7.2 Storage Temperature: Ambient.  
7.3 Inert Atmosphere: No requirement.  
7.4 Venting: Not listed.  
7.5 IMO Pollution Category: C  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.  
8.2 49 CFR Class: Not pertinent.  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 136.21  
9.3 Boiling Point at 1 atm: 417.2°F = 214°C = 487°K  
9.4 Freezing Point: 62.6°F = 17°C = 290°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 0.995 @ 20°C  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Currently not available  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent.  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# O-ISOPROPYL PHENOL

ISP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	8.300		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# ISOVALERALDEHYDE

IVA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isovaleral Isovaleric aldehyde 3-Methylbutanal 3-Methylbutyraldehyde	Liquid                      Colorless                      Weak suffocating odor  Floats on water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled will cause headache, nausea, vomiting or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn;  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 19; Aldehyde  
 2.2 **Formula:** (CH<sub>3</sub>)<sub>2</sub>CHCH<sub>2</sub>CHO  
 2.3 **IMO/UN Designation:** 3.2/1989  
 2.4 **DOT ID No.:** 1989  
 2.5 **CAS Registry No.:** Currently not available  
 2.6 **NAERG Guide No.:** 129  
 2.7 **Standard Industrial Trade Classification:** 51621

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves; air mask or self-contained breathing apparatus for high vapor concentrations.
- 3.2 **Symptoms Following Exposure:** Inhalation causes chest discomfort, nausea, vomiting, and headache. Contact of liquid with eyes or skin causes irritation. Ingestion causes irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; apply artificial respiration if required; get medical attention. EYES: flush with water for at least 15 min. SKIN: wipe off, wash well with soap and water. INGESTION: induce vomiting; get medical attention.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> > 3,200 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** (est.) 55°F O.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 5.3 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 7  
 Damage to living resources: 2  
 Human Oral hazard: 1  
 Human Contact hazard: II  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 86.1
- 9.3 **Boiling Point at 1 atm:** 198.5°F = 92.5°C = 365.7°K
- 9.4 **Freezing Point:** -60°F = -51°C = 222°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.785 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 23.7 dynes/cm = 0.0237 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** 3
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.0736
- 9.12 **Latent Heat of Vaporization:** (est.) 167 Btu/lb = 93 cal/g = 3.9 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -15,500 Btu/lb = -8,620 cal/g = -360 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISOVALERALDEHYDE

IVA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	51.060	34	0.431	52	1.048	40	0.687
40	50.750	36	0.432	54	1.048	50	0.635
45	50.440	38	0.433	56	1.048	60	0.589
50	50.130	40	0.434	58	1.048	70	0.547
55	49.810	42	0.436	60	1.048	80	0.510
60	49.500	44	0.437	62	1.048	90	0.477
65	49.190	46	0.438	64	1.048	100	0.447
70	48.880	48	0.439	66	1.048	110	0.419
75	48.560	50	0.440	68	1.048	120	0.395
80	48.250	52	0.441	70	1.048	130	0.372
85	47.940	54	0.442	72	1.048	140	0.352
90	47.630	56	0.443	74	1.048	150	0.333
95	47.320	58	0.444	76	1.048	160	0.316
100	47.000	60	0.446	78	1.048	170	0.300
		62	0.447	80	1.048	180	0.285
		64	0.448	82	1.048	190	0.272
		66	0.449	84	1.048		
		68	0.450	86	1.048		
		70	0.451				
		72	0.452				
		74	0.453				
		76	0.454				
		78	0.456				
		80	0.457				
		82	0.458				
		84	0.459				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	177	10.060	177	0.12670	0	0.301
	N	178	10.240	178	0.12880	20	0.311
	S	179	10.420	179	0.13090	40	0.322
	O	180	10.610	180	0.13310	60	0.332
	L	181	10.800	181	0.13520	80	0.343
	U	182	10.990	182	0.13740	100	0.353
	B	183	11.190	183	0.13960	120	0.363
	L	184	11.390	184	0.14190	140	0.372
	E	185	11.590	185	0.14420	160	0.382
		186	11.790	186	0.14650	180	0.392
		187	12.000	187	0.14880	200	0.401
		188	12.210	188	0.15120	220	0.411
		189	12.420	189	0.15360	240	0.420
		190	12.640	190	0.15600	260	0.429
		191	12.860	191	0.15850	280	0.438
		192	13.080	192	0.16100	300	0.447
		193	13.300	193	0.16350	320	0.455
		194	13.530	194	0.16600	340	0.464
		195	13.760	195	0.16860	360	0.472
		196	14.000	196	0.17120	380	0.481
		197	14.240	197	0.17390	400	0.489
		198	14.480	198	0.17660	420	0.497
		199	14.720	199	0.17930	440	0.505
		200	14.970	200	0.18200		
		201	15.220	201	0.18480		
		202	15.480	202	0.18760		

# JET FUELS: JP-4

JPF

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Watery liquid	Colorless	Fuel oil odor
	Floats on water.		
Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.			
Fire	FLAMMABLE. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
Exposure	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
Water Pollution	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula:  $C_{12}H_{24}$   
2.3 IMO/UN Designation: 3.2/1863  
2.4 DOT ID No.: 1863  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification:  
33412

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Protective gloves; goggles or face shield.  
3.2 Symptoms Following Exposure: Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema.  
3.3 Treatment of Exposure: ASPIRATION: enforce bed rest; administer oxygen; call a doctor.  
INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with plenty of water. SKIN: wipe off and wash with soap and water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2;  $LD_{50} = 0.5$  to  $5$  g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 Odor Threshold: 1 ppm  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:  $-10^{\circ}\text{F}$  to  $+30^{\circ}\text{F}$  C.C.  
4.2 Flammable Limits in Air: 1.3%-8.0%  
4.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature:  $464^{\circ}\text{F}$   
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: 4 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC):  $\text{N}_2$  diluent: 11.5%;  $\text{CO}_2$  diluent: 14.5%

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
500 ppm\*/salmon fingerling/lethal/ fresh water  
\*Time period not specified  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 53%, 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 100%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester) or pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at  $15^{\circ}\text{C}$  and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm:  $349$ - $549^{\circ}\text{F}$  =  $176$ - $287^{\circ}\text{C}$  =  $449$ - $560^{\circ}\text{K}$   
9.4 Freezing Point:  $< -54^{\circ}\text{F}$  =  $< -48^{\circ}\text{C}$  =  $< 225^{\circ}\text{K}$   
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.81 at  $20^{\circ}\text{C}$  (liquid)  
9.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at  $20^{\circ}\text{C}$   
9.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at  $20^{\circ}\text{C}$   
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.030  
9.12 Latent Heat of Vaporization: 140 Btu/lb = 78 cal/g =  $3.3 \times 10^5$  J/kg  
9.13 Heat of Combustion:  $-18,540$  Btu/lb =  $-10,300$  cal/g =  $-431.24 \times 10^5$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# JET FUELS: JP-4

JP4

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	51.740	0	0.444	0	0.926	-35	2.106
36	51.670	10	0.449	10	0.924	-30	1.994
38	51.600	20	0.454	20	0.921	-25	1.890
40	51.530	30	0.459	30	0.919	-20	1.794
42	51.460	40	0.464	40	0.917	-15	1.705
44	51.390	50	0.469	50	0.915	-10	1.622
46	51.320	60	0.474	60	0.913	-5	1.544
48	51.260	70	0.479	70	0.911	0	1.472
50	51.190	80	0.484	80	0.909	5	1.405
52	51.120	90	0.489	90	0.907	10	1.342
54	51.050	100	0.494	100	0.905	15	1.283
56	50.980	110	0.499	110	0.903	20	1.228
58	50.910	120	0.504	120	0.901	25	1.176
60	50.840	130	0.509	130	0.899	30	1.128
62	50.770	140	0.514	140	0.897	35	1.082
64	50.700	150	0.519	150	0.895	40	1.039
66	50.630	160	0.524	160	0.893	45	0.999
68	50.560	170	0.529	170	0.891	50	0.961
70	50.490	180	0.534	180	0.889	55	0.925
72	50.420	190	0.539	190	0.887	60	0.891
74	50.350	200	0.544	200	0.885	65	0.859
76	50.280	210	0.549	210	0.883	70	0.829
78	50.220					75	0.800
80	50.150						
82	50.080						
84	50.010						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	0	0.319		N		C
	N	10	0.411		O		U
	S	20	0.525		T		R
	O	30	0.663				R
	L	40	0.829		P		E
	U	50	1.028		E		N
	B	60	1.264		R		T
	L	70	1.542		T		L
	E	80	1.868		I		Y
		90	2.246		N		
		100	2.684		E		N
		110	3.187		N		O
		120	3.762		T		T
		130	4.416				
		140	5.155				A
		150	5.988				V
		160	6.922				A
		170	7.965				I
		180	9.125				L
		190	10.410				A
		200	11.830				B
		210	13.390				L
							E

# JET FUELS: JP-1

JPO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Fuel oil no. 1 Kerosene Kerosine Range oil	Watery liquid  Colorless  Fuel oil odor  Floats on water.
Keep people away. Avoid contact with liquid. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** C<sub>12</sub>H<sub>24</sub>  
2.3 **IMO/UN Designation:** 3.3/1223  
2.4 **DOT ID No.:** 1863  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 128  
2.7 **Standard Industrial Trade Classification:**  
33412

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs causes coughing, distress, and rapidly developing pulmonary edema.  
3.3 **Treatment of Exposure:** ASPIRATION: enforce bed rest; administer oxygen; call a doctor.  
INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with plenty of water. SKIN: wipe off and wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 1 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 100°F C.C.  
4.2 **Flammable Limits in Air:** 0.7%-5%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 444°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 10.5% @ 150°C; CO<sub>2</sub> diluent: 14.0% @ 150°C

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
2990 ppm/24 hr/bluegill/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 53%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 100%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 392 - 500°F = 200 - 260°C = 473 - 533°K  
9.4 **Freezing Point:** -45 to -55°F = -43 to -49°C = 316 to 321°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.80 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** 23 - 32 dynes/cm = 0.023 - 0.032 N/m at 20 °C  
9.9 **Liquid Water Interfacial Tension:** 47 - 49 dynes/cm = 0.047 - 0.049 N/m at 20 °C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.030  
9.12 **Latent Heat of Vaporization:** 110 Btu/lb = 60 cal/g = 2.5 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -18,540 Btu/lb = -10,300 cal/g = -431.24 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# JET FUELS: JP-1

JPO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	50.810	0	0.434	0	0.926	-35	6.727
36	50.740	10	0.439	10	0.924	-30	6.065
38	50.670	20	0.444	20	0.921	-25	5.482
40	50.600	30	0.449	30	0.919	-20	4.965
42	50.530	40	0.454	40	0.917	-15	4.508
44	50.460	50	0.459	50	0.915	-10	4.101
46	50.390	60	0.464	60	0.913	-5	3.739
48	50.320	70	0.469	70	0.911	0	3.416
50	50.250	80	0.474	80	0.909	5	3.127
52	50.180	90	0.479	90	0.907	10	2.867
54	50.110	100	0.484	100	0.905	15	2.634
56	50.040	110	0.489	110	0.903	20	2.424
58	49.970	120	0.494	120	0.901	25	2.235
60	49.900	130	0.499	130	0.899	30	2.064
62	49.830	140	0.504	140	0.897	35	1.909
64	49.760	150	0.509	150	0.895	40	1.768
66	49.700	160	0.514	160	0.893	45	1.641
68	49.630	170	0.519	170	0.891	50	1.525
70	49.560	180	0.524	180	0.889	55	1.419
72	49.490	190	0.529	190	0.887	60	1.322
74	49.420	200	0.534	200	0.885	65	1.233
76	49.350	210	0.539	210	0.883	70	1.152
78	49.280					75	1.078
80	49.210						
82	49.140						
84	49.070						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.041		N		C
	N	80	0.056		O		U
	S	90	0.075		T		R
	O	100	0.099				R
	L	110	0.130		P		E
	U	120	0.168		E		N
	B	130	0.217		R		T
	L	140	0.277		T		L
	E	150	0.350		I		Y
		160	0.440		N		
		170	0.548		E		N
		180	0.679		N		O
		190	0.835		T		T
		200	1.021				
		210	1.241				A
		220	1.500				V
		230	1.802				A
		240	2.154				I
		250	2.562				L
		260	3.033				A
		270	3.573				B
		280	4.192				L
		290	4.896				E
		300	5.695				



# JET FUELS: JP-3

JPT

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Watery liquid      Colorless      Fuel oil odor

Floats on water. Irritating, combustible vapor may be produced.

Keep people away. Avoid contact with liquid and vapor.  
Shut off ignition sources and call fire department.  
Stay upwind and use water spray to "knock down" vapor.  
Notify local health and pollution control agencies.

### Fire

Combustible.  
Extinguish with dry chemical, foam, or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.

#### VAPOR

Irritating to eyes, nose and throat.  
If inhaled, will cause coughing, dizziness, headache, or difficult breathing.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

#### LIQUID

Irritating to skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
DO NOT INDUCE VOMITING.

### Water Pollution

Dangerous to aquatic life in high concentrations.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33; Miscellaneous Hydrocarbon Mixtures
- 2.2 Formula:  $C_{12}H_{24}$
- 2.3 IMO/UN Designation: 3.3/1223
- 2.4 DOT ID No.: 1863
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 128
- 2.7 Standard Industrial Trade Classification: 33412

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Protective gloves; goggles or face shield.
- 3.2 Symptoms Following Exposure: Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema.
- 3.3 Treatment of Exposure: ASPIRATION: enforce bed rest; administer oxygen; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with plenty of water. SKIN: wipe off and wash with soap and water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $LD_{50} = 0.5$  to  $5$  g/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 Odor Threshold: 1 ppm
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: 110-150°F
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: 4 mm/min.
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC):  $N_2$  diluent: 12.0%;  $CO_2$  diluent: 14.5%

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 2990 ppm/24 hr/bluegill/TL<sub>m</sub>/fresh water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): 53%, 5 days
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 100%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open (flame arrester)
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid
- 8.2 49 CFR Class: 3
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: Not pertinent
- 9.3 Boiling Point at 1 atm: 86-500°F = 30-260°C = 303-533°K
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 0.80 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.030
- 9.12 Latent Heat of Vaporization: 140 Btu/lb = 78 cal/g =  $3.3 \times 10^5$  J/kg
- 9.13 Heat of Combustion: -18,540 Btu/lb = -10,300 cal/g =  $-431.24 \times 10^5$  J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# JET FUELS: JP-3

JPT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
32	49.940	0	0.444	0	1.458	-35	2.106
34	49.940	10	0.449	10	1.456	-30	1.994
36	49.940	20	0.454	20	1.454	-25	1.890
38	49.940	30	0.459	30	1.452	-20	1.794
40	49.940	40	0.464	40	1.450	-15	1.705
42	49.940	50	0.469	50	1.448	-10	1.622
44	49.940	60	0.474	60	1.446	-5	1.544
46	49.940	70	0.479	70	1.444	0	1.472
48	49.940	80	0.484	80	1.442	5	1.405
50	49.940					10	1.342
52	49.940					15	1.283
54	49.940					20	1.228
56	49.940					25	1.176
58	49.940					30	1.128
60	49.940					35	1.082
62	49.940					40	1.039
64	49.940					45	0.999
66	49.940					50	0.961
68	49.940					55	0.925
70	49.940					60	0.891
72	49.940					65	0.859
74	49.940					70	0.829
76	49.940					75	0.800
78	49.940						
80	49.940						
82	49.940						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	0	0.855		N		C
	N	10	1.092		O		U
	S	20	1.379		T		R
	O	30	1.726				R
	L	40	2.141		P		E
	U	50	2.634		E		N
	B	60	3.213		R		T
	L	70	3.891		T		L
	E	80	4.679		I		Y
		90	5.589		N		
		100	6.633		E		N
		110	7.825		N		O
		120	9.178		T		T
		130	10.710				
		140	12.430				A
		150	14.360				V
		160	16.500				A
		170	18.890				I
		180	21.530				L
		190	24.440				A
		200	27.640				B
		210	31.140				L
							E

# JET FUELS: JP-5

JPV

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Kerosene, heavy	Liquid Colorless Fuel oil odor  Floats on water.
Keep people away. Avoid contact with liquid. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** Not pertinent  
2.3 **IMO/UN Designation:** 3.3/2761  
2.4 **DOT ID No.:** 1863  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 128  
2.7 **Standard Industrial Trade Classification:** 33412

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema.  
3.3 **Treatment of Exposure:** ASPIRATION: Enforce bed rest; administer oxygen; call a doctor.  
INGESTION: Do NOT induce vomiting; call a doctor. EYES: Wash with plenty of water. SKIN: wipe off and wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 1 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 140°F (min.)C.C.  
4.2 **Flammable Limits in Air:** 0.6%-4.6%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 475°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 500 ppm"/salmon fingerling/lethal/ fresh water  
\*Time period not specified  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 53%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 100%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 349-549°F = 176-287°C = 449-560°K  
9.4 **Freezing Point:** <-54°F = <-48°C = <-225°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.82 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 140 Btu/lb = 78 cal/g = 3.3 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -18,540 Btu/lb = -10,300 cal/g = -431.24 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# JET FUELS: JP-5

JPV

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	52.370	0	0.444	0	0.926	-35	10.600
36	52.300	10	0.449	10	0.924	-30	9.614
38	52.230	20	0.454	20	0.921	-25	8.739
40	52.160	30	0.459	30	0.919	-20	7.960
42	52.090	40	0.464	40	0.917	-15	7.266
44	52.020	50	0.469	50	0.915	-10	6.646
46	51.950	60	0.474	60	0.913	-5	6.090
48	51.880	70	0.479	70	0.911	0	5.592
50	51.810	80	0.484	80	0.909	5	5.144
52	51.740	90	0.489	90	0.907	10	4.740
54	51.670	100	0.494	100	0.905	15	4.376
56	51.600	110	0.499	110	0.903	20	4.046
58	51.530	120	0.504	120	0.901	25	3.747
60	51.460	130	0.509	130	0.899	30	3.476
62	51.390	140	0.514	140	0.897	35	3.229
64	51.320	150	0.519	150	0.895	40	3.004
66	51.260	160	0.524	160	0.893	45	2.799
68	51.190	170	0.529	170	0.891	50	2.612
70	51.120	180	0.534	180	0.889	55	2.440
72	51.050	190	0.539	190	0.887	60	2.282
74	50.980	200	0.544	200	0.885	65	2.138
76	50.910	210	0.549	210	0.883	70	2.005
78	50.840					75	1.883
80	50.770						
82	50.700						
84	50.630						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	130	0.101		N		C
	N	140	0.130		O		U
	S	150	0.166		T		R
	O	160	0.210				R
	L	170	0.264		P		E
	U	180	0.330		E		N
	B	190	0.409		R		T
	I	200	0.504		T		L
	E	210	0.616		I		Y
		220	0.750		N		
		230	0.907		E		N
		240	1.091		N		O
		250	1.306		T		T
		260	1.555				
		270	1.843				A
		280	2.174				V
		290	2.553				A
		300	2.986				I
							L
							A
							B
							L
							E

# KEPONE

KPE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlordecone Decachloroketone ENT-16391 GC-1189 Merex	Crystalline solid      Colorless      Odorless
Keep people away. Avoid contact with solid or dust. Wear goggles, self-contained breathing apparatus, rubber overclothing (including gloves). Notify local health and pollution control agencies.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR DUST POISONOUS IF SWALLOWED, INHALED, OR IF SKIN IS EXPOSED. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
 2.2 **Formula:** C<sub>10</sub>Cl<sub>10</sub>O  
 2.3 **IMO/UN Designation:** 6.1/1615 (>10%); 9/1615 (<10%)  
 2.4 **DOT ID No.:** 2761  
 2.5 **CAS Registry No.:** 143-50-0  
 2.6 **NAERG Guide No.:** 151  
 2.7 **Standard Industrial Trade Classification:** 59110

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, self-contained breathing apparatus, and protective clothing.  
 3.2 **Symptoms Following Exposure:** INHALATION AND INGESTION: These symptoms present in all affected patients - Neurologic Impairment - anxiety, irritability, memory disturbance, headache, tremors, opsiclonus, stuttering, slurred speech, and abnormal tandem gait.  
 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove from exposure. EYES: Flush with copious amounts of water. SKIN: Wash thoroughly with soap and water. INGESTION: Induce emesis or perform gastric lavage. Give saline cathartic. Barbiturates to control tremors or convulsions.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg.  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** 80-week rat and mouse study. 2-dose levels - generalized tumors and dermatologic changes. Significant increase in hepatocellular carcinomas. Hyperplasia of liver. Neurologic symptoms, sterility; brain and liver damage, fetal toxicity; teratogenic effects, anemia.  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Odorless  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Currently not available  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
 4.5 **Special Hazards of Combustion Products:** Currently not available  
 4.6 **Behavior in Fire:** Currently not available  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Currently not available  
 5.2 **Reactivity with Common Materials:** Currently not available  
 5.3 **Stability During Transport:** Currently not available  
 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
 5.5 **Polymerization:** Currently not available  
 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 0.066 ppm/24-hour/Rainbow trout/LC<sub>50</sub>  
 0.020 ppm/96-hour/Rainbow trout/LC<sub>50</sub>  
 0.5 ppm/24-hour/Juvenile white mullet/LC<sub>50</sub>  
 0.055 ppm/48-hour/Juvenile white mullet/LC<sub>50</sub>  
 0.3 ppm/24-hour/Longnose killifish/LC<sub>50</sub>  
 0.084 ppm/48-hour/Longnose killifish/LC<sub>50</sub>  
 0.0375 ppm/48-hour/Rainbow trout/LC<sub>50</sub>  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** Highly bioaccumulative (425 to 20,000 times)  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 50% Wettable powder; 2% to 4% Baits  
 7.2 **Storage Temperature:** Currently not available  
 7.3 **Inert Atmosphere:** Currently not available  
 7.4 **Venting:** Currently not available  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
 8.2 **49 CFR Class:** 6.1  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** 1 pound  
 8.7 **EPA Pollution Category:** X  
 8.8 **RCRA Waste Number:** U142  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
 9.2 **Molecular Weight:** 490.68  
 9.3 **Boiling Point at 1 atm:** Sublimes with decomposition at 350°C  
 9.4 **Freezing Point:** 662°F = 349°C = 623.2°K  
 9.5 **Critical Temperature:** Currently not available  
 9.6 **Critical Pressure:** Currently not available  
 9.7 **Specific Gravity:** Currently not available  
 9.8 **Liquid Surface Tension:** Currently not available  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
 9.12 **Latent Heat of Vaporization:** Currently not available  
 9.13 **Heat of Combustion:** Currently not available  
 9.14 **Heat of Decomposition:** Currently not available  
 9.15 **Heat of Solution:** Currently not available  
 9.16 **Heat of Polymerization:** Currently not available  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# KEPONE

KPE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
212	0.470		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# KEROSENE

KRS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Fuel oil no. 1 Illuminating oil Jet fuel: JP-1 Kerosine Range oil	Watery liquid  Colorless  Fuel oil odor  Floats on water.
Keep people away. Avoid contact with liquid. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula:  $C_{12}H_{24}$   
2.3 IMO/UN Designation: 3.3/1223  
2.4 DOT ID No.: 1223  
2.5 CAS Registry No.: 8008-20-6  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 33421

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema.  
3.3 **Treatment of Exposure:** ASPIRATION: enforce bed rest; administer oxygen; call a doctor.  
INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with plenty of water. SKIN: wipe off and wash with soap and water.  
3.4 **TLV-TWA:** Notice of intended change: 100 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 1 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 100°F (min.)C.C.  
4.2 **Flammable Limits in Air:** 0.7%-5%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 444°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 10.0% at 150°C; CO<sub>2</sub> diluent: 13.0% at 150°C

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 2990 ppm/24 hr/bluegill/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 53%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Light hydrocarbon distillate: 100%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 392-500°F = 200-260°C = 473-533°K  
9.4 **Freezing Point:** -50°F = -45.6°C = 227.6°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.80 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** 23-32 dynes/cm = 0.023-0.032 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 47-49 dynes/cm = 0.047-0.049 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 110 Btu/lb = 60 cal/g = 2.5 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -18,540 Btu/lb = -10,300 cal/g = -431.24 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.1 psia

### NOTES

# KEROSENE

KRS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	50.810	0	0.434	0	0.926	-35	6.727
36	50.740	10	0.439	10	0.924	-30	6.065
38	50.670	20	0.444	20	0.921	-25	5.482
40	50.600	30	0.449	30	0.919	-20	4.965
42	50.530	40	0.454	40	0.917	-15	4.508
44	50.460	50	0.459	50	0.915	-10	4.101
46	50.390	60	0.464	60	0.913	-5	3.739
48	50.320	70	0.469	70	0.911	0	3.416
50	50.250	80	0.474	80	0.909	5	3.127
52	50.180	90	0.479	90	0.907	10	2.867
54	50.110	100	0.484	100	0.905	15	2.634
56	50.040	110	0.489	110	0.903	20	2.424
58	49.970	120	0.494	120	0.901	25	2.235
60	49.900	130	0.499	130	0.899	30	2.064
62	49.830	140	0.504	140	0.897	35	1.909
64	49.760	150	0.509	150	0.895	40	1.768
66	49.700	160	0.514	160	0.893	45	1.641
68	49.630	170	0.519	170	0.891	50	1.525
70	49.560	180	0.524	180	0.889	55	1.419
72	49.490	190	0.529	190	0.887	60	1.322
74	49.420	200	0.534	200	0.885	65	1.233
76	49.350	210	0.539	210	0.883	70	1.152
78	49.280					75	1.078
80	49.210						
82	49.140						
84	49.070						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.041		N		C
	N	80	0.056		O		U
	S	90	0.075		T		R
	O	100	0.099				R
	L	110	0.130		P		E
	U	120	0.168		E		N
	B	130	0.217		R		T
	L	140	0.277		T		L
	E	150	0.350		I		Y
		160	0.440		N		
		170	0.548		E		N
		180	0.679		N		O
		190	0.835		T		T
		200	1.021				
		210	1.241				A
		220	1.500				V
		230	1.802				A
		240	2.154				I
		250	2.562				L
		260	3.033				A
		270	3.573				B
		280	4.192				L
		290	4.896				E
		300	5.695				



# LEAD ACETATE

LAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lead acetate trihydrate Neutral lead acetate Normal lead acetate Salt of Saturn Sugar of lead	Solid  White  Odorless   Sinks and mixes with water.
Evacuate. KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST. Wear dust respirator. Notify local health and pollution control agencies.	
<b>Fire</b>	NOT FLAMMABLE.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. If inhaled will cause dizziness or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $Pb(C_2H_3O_2)_2 \cdot 3H_2O$   
2.3 IMO/UN Designation: 9/1616  
2.4 DOT ID No.: 1616  
2.5 CAS Registry No.: 301-04-2  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 51371

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask and protective gloves  
3.2 **Symptoms Following Exposure:** Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders, colic, constipation, etc.; weakness, which may go on to paralysis, chiefly of the extensor muscles of the wrists and less often of the ankles, is noticeable in the most serious cases. Ingestion of a large amount causes local irritation of the alimentary tract; pain, leg cramps, muscle weakness, paresthesias, depression, coma, and death may follow in 1 or 2 days. Contact with eyes causes irritation.  
3.3 **Treatment of Exposure:** Remove at once all cases of lead intoxication from further exposure until the blood level is reduced to a safe value; immediately place the individual under medical care.  
INGESTION: give gastric lavage using 1% solution of sodium or magnesium sulfate; leave 15-30 gm magnesium sulfate in 6-8 oz. of water in the stomach as antidote and cathartic; egg white, milk, and tannin are useful demulcents; atropine sulfate and other antispasmodics may relieve abdominal pain, but morphine may be necessary. EYES or SKIN: flush with water.  
3.4 TLV-TWA: 0.05 mg/m<sup>3</sup> (as lead)  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 100 mg Pb/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 0.05 mg/m<sup>3</sup> (as lead)  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating acid fumes may be formed in fires.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
50 ppm/16-183 days/catfish/bloodcell injury/tap water  
7.48 mg/(as Pb)/4 days/minnow/TL<sub>m</sub>/soft water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Fish and terrestrial animals are capable of concentrating lead.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: (2)  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** NF; Reagent; Technical, 97%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** U144  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 379.3  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 2.55 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# LEAD ACETATE

LAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	21.060		N		N		N
36	22.430		O		O		O
38	23.800		T		T		T
40	25.160						
42	26.530		P		P		P
44	27.900		E		E		E
46	29.260		R		R		R
48	30.630		T		T		T
50	32.000		I		I		I
52	33.360		N		N		N
54	34.730		E		E		E
56	36.100		N		N		N
58	37.460		E		E		E
60	38.830		N		N		N
62	40.200		T		T		T
64	41.560						
66	42.930						
68	44.300						
70	45.660						
72	47.030						
74	48.400						
76	49.760						
78	51.130						
80	52.500						
82	53.860						
84	55.230						

# LITHIUM ALUMINUM HYDRIDE

LAH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	
LAH	Solid powder      White to gray      Odorless
Reacts violently with water. Flammable gas is produced.	
Evacuate. Restrict human use; farm use; industrial use. Keep people away. Avoid contact with solid and dust. Wear rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Flammable gas is released on contact with water, metals, or acids. Wear rubber overclothing (including gloves). DO NOT USE WATER, DRY CHEMICALS, CARBON DIOXIDE, OR FOAM. Extinguish with powdered limestone or powdered graphite.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: LiAlH<sub>4</sub>  
2.3 IMO/UN Designation: 4.3/1410  
2.4 DOT ID No.: 1410  
2.5 CAS Registry No.: 1302-30-3  
2.6 NAERG Guide No.: 138  
2.7 Standard Industrial Trade Classification: 52495

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Rubberized gloves; full face shield.  
3.2 Symptoms Following Exposure: Contact of solid with eyes and skin causes severe burns similar to those caused by caustic soda.  
3.3 Treatment of Exposure: In case of accidental contact with the skin, wipe off excess with a dry paper towel. Wash the affected area with a large volume of water to prevent localized heating of the skin.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: Moisture of skin causes caustic burns.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Flammable Solid  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Powdered graphite, powdered salt, or powdered limestone  
4.4 Fire Extinguishing Agents Not to Be Used: Do NOT use water, soda acid, carbon dioxide or dry chemical.  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Decomposes at 257°F to form hydrogen gas. The heat generated may cause ignition and/or explosion.  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Class 1, Group B  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 9.5 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 3.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts violently with water as a dry solid or when dissolved in ether. The hydrogen produced by the reaction with water is a major hazard and necessitates adequate ventilation.  
5.2 Reactivity with Common Materials: Can burn in heated or moist air.  
5.3 Stability During Transport: Normally stable; unstable at high temperatures.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 95-98%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Dry air  
7.4 Venting: Store container in well-ventilated area.  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Dangerous When Wet  
8.2 49 CFR Class: 4.3  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	2
Special (White).....	W

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 37.94  
9.3 Boiling Point at 1 atm: Decomposes  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.917 at 15°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# LITHIUM ALUMINUM HYDRIDE

LAH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# LINEAR ALCOHOLS

LAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dodecanol Pentadecanol Tetradecanol Tridecanol	Solid or liquid  Colorless  Mild alcohol odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with alcohol foam, dry chemical, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_{10-15}\text{CH}_2\text{OH}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 1987  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51219

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Eye protection.  
3.2 Symptoms Following Exposure: Direct contact can produce eye irritation. Low general toxicity.  
3.3 Treatment of Exposure: Wash eyes with water for at least 15 min.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 1;  $\text{LD}_{50} = 5$  to 15 g/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: None  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 180°F-285°F O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 29%, 1 day  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: >186  
9.3 Boiling Point at 1 atm:  $>486^\circ\text{F} = >252^\circ\text{C} = >525^\circ\text{K}$   
9.4 Freezing Point:  $>66^\circ\text{F} = >19^\circ\text{C} = >292^\circ\text{K}$   
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.84 at 20°C (liquid)  
9.8 Liquid Surface Tension: (est.) 30 dynes/cm = 0.03 N/m at 30°C  
9.9 Liquid Water Interfacial Tension: (est.) 30 dynes/cm = 0.03 N/m at 30°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.)  $-18,500 \text{ Btu/lb} = 10,300 \text{ cal/g} = -429 \times 10^5 \text{ J/kg}$   
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# LINEAR ALCOHOLS

LAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	52.430	86	0.525	86	1.040	86	3.679
69	52.430	87	0.525	87	1.040	87	3.591
70	52.430	88	0.525	88	1.040	88	3.506
71	52.430	89	0.525	89	1.040	89	3.423
72	52.430	90	0.525	90	1.040	90	3.342
73	52.430	91	0.525	91	1.040	91	3.264
74	52.430	92	0.525	92	1.040	92	3.187
75	52.430	93	0.525	93	1.040	93	3.113
76	52.430	94	0.525	94	1.040	94	3.040
77	52.430	95	0.525	95	1.040	95	2.970
78	52.430	96	0.525	96	1.040	96	2.901
79	52.430	97	0.525	97	1.040	97	2.835
80	52.430	98	0.525	98	1.040	98	2.770
81	52.430	99	0.525	99	1.040	99	2.706
82	52.430	100	0.525	100	1.040	100	2.645
83	52.430	101	0.525	101	1.040	101	2.585
84	52.430	102	0.525	102	1.040	102	2.526
85	52.430	103	0.525	103	1.040	103	2.469

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	86	0.002	86	0.00006		N
	N	87	0.002	87	0.00006		O
	S	88	0.002	88	0.00006		T
	O	89	0.002	89	0.00007		P
	L	90	0.002	90	0.00007		E
	U	91	0.002	91	0.00007		R
	B	92	0.002	92	0.00007		T
	I	93	0.002	93	0.00008		I
	E	94	0.003	94	0.00008		N
		95	0.003	95	0.00008		E
		96	0.003	96	0.00008		N
		97	0.003	97	0.00009		T
		98	0.003	98	0.00009		
		99	0.003	99	0.00009		
		100	0.003	100	0.00010		
		101	0.003	101	0.00010		
		102	0.003	102	0.00010		
		103	0.003	103	0.00011		

# LEAD ARSENATE

LAR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lead arsenate, acid Plumbous arsenate	Solid  White  Odorless  Sinks in water.
Keep people away. AVOID CONTACT WITH SOLID. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID POISONOUS IF SWALLOWED. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CON- VULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $PbHAsO_4$   
2.3 IMO/UN Designation: 6.1/1617  
2.4 DOT ID No.: 1617  
2.5 CAS Registry No.: 3687-31-8  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification:  
52499

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; protective clothing to prevent accidental inhalation or ingestion of dust.  
3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes dizziness, headache, paralysis, cramps, constipation, collapse, coma. Subacute doses cause irritability, loss of weight, anemia, constipation. Blood and urine concentrations of lead increase.  
3.3 **Treatment of Exposure:** A specific medical treatment is used for exposure to this chemical; call a physician immediately] Give victim a tablespoon of salt in glass of warm water and repeat until vomit is clear. Then give two tablespoons of epsom salt or milk of magnesia in water, and plenty of milk and water. Have victim lie down and keep quiet.  
3.4 **TLV-TWA:** (dust) 0.15 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> below 50 mg/kg (rabbit, rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Lead poisoning  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** None  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** 0.01 mg/m<sup>3</sup>  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.4 ppm/48 hr/bluegill/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 94%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 1 pound  
8.7 EPA Pollution Category: X  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 347.12  
9.3 Boiling Point at 1 atm: Decomposes  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 5.79 at 15°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

NOTES

# LEAD ARSENATE

LAR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T



# LITHIUM BICHROMATE

LBC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lithium bichromate dihydrate Lithium dichromate	Solid, crystal  Orange red to black brown  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled, will cause difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. If swallowed can cause dizziness, nausea, vomiting or coma. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Li}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52499

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Approved dust mask, goggles or face shield, rubber gloves.
- 3.2 Symptoms Following Exposure: INHALATION: Corrosive to mucous membranes. SKIN: Causes dermatitis and slow-healing ulcers. EYES: Conjunctivitis and lacrimation. INGESTION: Violent gastroenteritis, peripheral vascular collapse, vertigo, muscle cramps, coma, hemorrhagic diathesis, fever, liver damage and renal failure.
- 3.3 Treatment of Exposure: Call a doctor. INHALATION: Move to fresh air. EYES: Hold lids open and flush immediately with a slow stream of water. Continue for 10 to 15 minutes. SKIN: Wash with large amounts of water then apply a paste of sodium bicarbonate. INGESTION: Drink copious amounts of water. Administer a neutralizer like milk of magnesia, calcium hydroxide, etc. Do not induce vomiting. Call a physician.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 3;  $\text{LD}_{50} = 50$  to 500 mg/kg.
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: A recognized carcinogen of the lungs, nasal cavity, and paranasal sinus. Lithium is teratogenic.
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Severe skin irritant; causes second and third degree burns on short contact and is very injurious to the eye.
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Flood spill area with water.
- 4.4 Fire Extinguishing Agents Not to Be Used: Currently not available
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: May decompose giving off oxygen with supports further combustion.
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: An oxidizer, can react with combustibles.
- 5.3 Stability During Transport: Currently not available
- 5.4 Neutralizing Agents for Acids and Caustics: Currently not available
- 5.5 Polymerization: Currently not available
- 5.6 Inhibitor of Polymerization: Currently not available

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: (For hexavalent chromium compounds)  
145 mg/l/24-hour/TL<sub>m</sub>/Bluegills  
103 mg/l/96-hour/TL<sub>m</sub>/Bluegills  
100 mg/l/24-hour/TL<sub>m</sub>/Trout  
110 mg/l/96-hour/TL<sub>m</sub>/Sunfish
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: Cr can be accumulated and concentrated in fish.
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available
- 7.2 Storage Temperature: Currently not available
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	0
Instability (Yellow).....	1
Special (White).....	OX
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 265.93
- 9.3 Boiling Point at 1 atm: Decomposes 368.6°F = 187°C = 460.2°K
- 9.4 Freezing Point: 230 to 266°F = 110 to 130°C = 283.2 to 403.2°K
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 2.34 at 30°C
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Currently not available
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Currently not available
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# LITHIUM BICHROMATE

LBC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
40	135.901		C		C		C
50	149.480		U		U		U
60	161.577		R		R		R
70	172.563		R		R		R
80	182.683		E		E		E
90	192.101		N		N		N
100	200.938		T		T		T
110	209.279		L		L		L
120	217.198		Y		Y		Y
130	224.745						
140	231.967		N		N		N
150	238.898		O		O		O
160	245.570		T		T		T
170	252.007						
180	258.230		A		A		A
190	264.258		V		V		V
200	270.107		A		A		A
210	275.792		I		I		I
			L		L		L
			A		A		A
			B		B		B
			L		L		L
			E		E		E

# LEAD CHLORIDE

LCL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lead (II) chloride Lead dichloride Plumbous chloride		Solid  White   Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Wear goggles, self-contained breathing apparatus, rubber overclothing (including gloves). Notify local health and pollution control agencies.		
<b>Fire</b>	Not flammable. POISONOUS METAL FUMES MAY BE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus, rubber overclothing (including gloves).	
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST AND FUMES. POISONOUS IF INHALED. Move to fresh air. Keep victim quiet and warm.  SOLID If swallowed, may cause metallic taste, abdominal pain, vomiting and diarrhea. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS, do nothing except keep victim warm.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: PbCl <sub>2</sub> 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 2291 2.5 CAS Registry No.: 7758-95-4 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 52329
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Wear approved filter mask, rubber gloves, and safety glasses. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Joint and muscle pains, headache, dizziness and insomnia. Weakness, frequently of extensor muscles of hand and wrist (unilateral or bilateral). Heavy contamination - brain damage. Stupor progressing to coma - with or without convulsion, often death. Excitation, confusion, and mania less common. Cerebrospinal pressure may be increased. INGESTION: Abdominal pain, diarrhea, constipation, loss of appetite, muscular weakness, headache, blue line on gums, metallic taste, nausea, and vomiting. 3.3 <b>Treatment of Exposure:</b> Call a physician. INHALATION: Remove from source of exposure. Keep victim quiet and warm. EYES: Flush with plenty of water. SKIN: Wash with soap and water. INGESTION: Induce vomiting and follow with gastric lavage. Administer saline cathartic and an enema. Give antispasmodic (calcium gluconate, atropine, papaverine) for relief of colic. If pain is severe morphine sulfate may be considered. 3.4 TLV-TWA: 0.05 mg/m <sup>3</sup> as (lead). 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Guinea pig minimum lethal dose 1500 to 2000 mg/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> In man 6 mg/m <sup>3</sup> /day inhaled long term produces histological and pathological effects. 1.2 mg/day ingested long term produces CNS disorders. Teratogenic effects. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 100 mg Pb/m <sup>3</sup> 3.14 <b>OSHA PEL-TWA:</b> 0.05 mg/m <sup>3</sup> (as lead). 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic metal fumes
- 4.6 **Behavior in Fire:** Can emit toxic metal fumes
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
5.58 ppm/96-hour/ TL<sub>m</sub>/Fathead minnow/soft water  
482 ppm/96-hour/TL<sub>m</sub>/Fathead minnow/hard water  
23.8 ppm/96-hour/TL<sub>m</sub>/Bluegill /soft water  
442 ppm/96-hour/TL<sub>m</sub>/Bluegill /hard water  
31.5 ppm/96-hour/TL<sub>m</sub>/Goldfish /soft water  
20.6 ppm/96-hour/TL<sub>m</sub>/Guppy /soft water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Both fish and animal life can concentrate lead.
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 278.12
- 9.3 **Boiling Point at 1 atm:** 1742°F = 950°C = 1223.2°K
- 9.4 **Freezing Point:** 933.8°F = 501°C = 774.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 5.85 at room temperature
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 9.59 (calculated)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** 191.5 Btu/lb = 106.4 cal/g = 4.45 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Endothermic 40.1 Btu/lb = 22.3 cal/g = 0.93 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 20.3 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# LEAD CHLORIDE

LCL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T	575 600 625 650 675 700 725 750 775 800 825 850 875 900 925 950 975 1000 1025 1050 1075 1100 1125 1150 1175 1200	0.074 0.075 0.075 0.075 0.076 0.076 0.077 0.077 0.078 0.078 0.078 0.079 0.079 0.080 0.080 0.081 0.081 0.081 0.082 0.082 0.083 0.083 0.084 0.084 0.084 0.085		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210	0.595 0.744 0.892 1.041 1.190 1.338 1.487 1.636 1.785 1.933 2.082 2.231 2.379 2.528 2.677 2.826 2.974 3.123		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# LITHIUM CHROMATE

LCR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chromic acid, dilithium salt Chromium lithium oxide Dilithium chromate	Solid crystalline powder  Yellow  Mixes with water.
Keep people away. Avoid contact with solid and dust. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. May cause fires on contact with combustibles. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose, and throat. If inhaled, will cause difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. If swallowed can cause dizziness, nausea, vomiting or coma. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. If swallowed and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{Li}_2\text{CrO}_4 \cdot 2\text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 14307-35-8  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 52499

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved filter-type respirator, close-fitting safety goggles, laboratory coat.  
3.2 **Symptoms Following Exposure:** INHALATION: Corrosive to skin and mucous membranes causing dermatitis and slow healing ulcers. EYES: Conjunctivitis and lacrimation. INGESTION: Violent gastroenteritis, peripheral vascular collapse, vertigo, muscle cramps, coma, hemorrhagic diathesis, fever, liver damage and renal failure.  
3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Move to fresh air. EYES: Hold lids open and flush immediately with a slow stream of water. Continue for 10 to 15 minutes. SKIN: Wash with large amounts of water then apply a paste of sodium bicarbonate. INGESTION: Drink copious amounts of water. Administer a neutralizer like milk of magnesia, calcium hydroxide, etc. Do not induce vomiting. Call a physician.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50} = 50$  to 500 mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** A recognized carcinogen of the lungs, nasal cavity, and paranasal sinus. Lithium compounds may be teratogenic.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Can oxidize combustibles.  
5.3 **Stability During Transport:** Currently not available  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
For hexavalent Cr compounds 103 mg/l  
96-hour  $\text{TLM}$  Bluegill  
145 mg/l 24-hour  $\text{TLM}$  Bluegill  
100 mg/l 24-hour  $\text{TLM}$  Trout  
110 mg/l 96-hour  $\text{TLM}$  Sunfish  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Cr can be accumulated and concentrated in fish.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Cool  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Well ventilated  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 165.92  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 5.72 (calculated)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# LITHIUM CHROMATE

LCR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68 70 72 74 76 78 80 82 84 86	111.000 109.778 108.556 107.332 106.110 104.889 103.667 102.443 101.221 100.000		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# LEAD FLUOROBORATE

LFB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lead fluoroborate Lead fluoroborate solution	Liquid  Colorless  Odorless  Sinks and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles and self-contained breathing apparatus. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. Irritating gases may be produced when heated. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. If inhaled will cause dizziness or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $Pb(BF_4)_2 \cdot H_2O$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2291  
2.5 CAS Registry No.: 1314-96-5  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 52384

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; face shield; rubber apron  
3.2 **Symptoms Following Exposure:** Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders, colic, constipation, etc.; weakness, which may go on to paralysis, chiefly of the extensor muscles of the wrists and less often of the ankles, is noticeable in the most serious cases. Ingestion of a large amount causes local irritation of the alimentary tract; pain, leg cramps, muscle weakness, paresthesias, depression, coma, and death may follow in 1 or 2 days. Contact with eyes or skin may cause burns and/or irritation.  
3.3 **Treatment of Exposure:** Remove at once all cases of lead intoxication from further exposure until the blood level is reduced to a safe value; immediately place the individual under medical care.  
INGESTION: give gastric lavage using 1% solution of sodium or magnesium sulfate; leave 15-30 gm magnesium sulfate in 8-9 oz. of water in the stomach as antidote and cathartic; egg white, milk, and tannin are useful demulcents; atropine sulfate and other antispasmodics may relieve abdominal pain, but morphine may be necessary. EYES: flush with copious quantities of water for 15 min. SKIN: wash area with soap and water; treat as an acid burn.  
3.4 TLV-TWA: 0.05 mg/m<sup>3</sup> (as lead)  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5-5 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 100 mg Pb/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 0.05 mg/m<sup>3</sup> (as lead)  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Toxic and irritating hydrogen fluoride gas may form in fire.  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Solution is acidic and will corrode most metals.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash.  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: May be toxic.  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: Bioconcentrative.  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 50-62% solutions in water  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Mixture  
9.3 Boiling Point at 1 atm: Not pertinent  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.75 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# LEAD FLUOROBORATE

LFB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	109.200		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# LEAD FLUORIDE

LFR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lead difluoride Plumbous fluoride	Solid  White  Odorless  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear dust respirator. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. If inhaled will cause dizziness or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: PbF <sub>2</sub> 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 2291 2.5 CAS Registry No.: 7783-46-2 2.6 NAERG Guide No.: 154 2.7 Standard Industrial Trade Classification: 52310
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Dust and fumes of all but the most insoluble lead compounds are readily absorbed on inhalation and, to a lesser degree, after ingestion. Respirator for heavy dust exposure; safety goggles 3.2 <b>Symptoms Following Exposure:</b> Not irritating to skin or mucuous membranes; protect against chronic poisoning. Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders, colic, constipation, etc.; weakness, which may go on to paralysis chiefly of the extensor muscles of the wrists and less often the ankles, is noticeable in the most serious cases. Ingestion of a large amount causes local irritation of the alimentary tract; pain, leg cramps, muscle weakness, paresthesias, depression, coma, and death may follow in 1 or 2 days. Contact with eyes causes irritation. 3.3 <b>Treatment of Exposure:</b> Remove at once all cases of lead intoxication from further exposure until the blood level is reduced to a safe value; immediately place the individual under medical care. INGESTION: give gastric lavage using 1% solution of sodium or magnesium sulfate; leave 15-30 gm magnesium sulfate in 6-8 oz. of water in the stomach as antidote and cathartic; egg white, milk, and tannin are useful demulcents; atropine sulfate and other antispasmodics may relieve abdominal pain, but morphine may be necessary. EYES or SKIN: flush with water. 3.4 TLV-TWA: 0.05 mg/m <sup>3</sup> (as lead) 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 2: LD <sub>50</sub> = 0.5-5 g/kg 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: 100 mg Pb/m <sup>3</sup> 3.14 OSHA PEL-TWA: 0.05 mg/m <sup>3</sup> (as lead). 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 7.48 mg/(as Pb)/4 days/minnow/TL<sub>m</sub>/soft water  
6.2 Waterfowl Toxicity: May be toxic  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: Bioconcentrative  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical; C.P.; Optical grade  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 245.19  
9.3 Boiling Point at 1 atm: Not pertinent  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 8.24 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 7.6 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# LEAD FLUORIDE

LFR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.064		N		N		N
36	0.064		O		O		O
38	0.064		T		T		T
40	0.064						
42	0.064		P		P		P
44	0.064		E		E		E
46	0.064		R		R		R
48	0.064		T		T		T
50	0.064		I		I		I
52	0.064		N		N		N
54	0.064		E		E		E
56	0.064		N		N		N
58	0.064		E		E		E
60	0.064		N		N		N
62	0.064		T		T		T
64	0.064						
66	0.064						
68	0.064						
70	0.064						
72	0.064						
74	0.064						
76	0.064						
78	0.064						
80	0.064						
82	0.064						
84	0.064						

# LITHIUM HYDRIDE

LHD

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid Crystals are gray or blue; powder is white Odorless

Reacts violently with water. Flammable gas is produced.

Evacuate.  
**KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.**  
Wear dust respirator and rubber overclothing (including gloves).  
Shut off ignition sources and call fire department.  
Notify local health and pollution control agencies.

### Fire

Combustible.  
Irritating flammable gas may be produced when heated.  
Extinguish with dry graphite, soda ash, or other inert powder.  
**DO NOT USE WATER, FOAM, CARBON DIOXIDE OR DRY CHEMICALS ON FIRE OR ADJACENT FIRES.**

### Exposure

CALL FOR MEDICAL AID.  
DUST  
POISONOUS IF INHALED.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.  
  
SOLID  
Will burn skin and eyes.  
If swallowed will cause nausea or loss of consciousness.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: LiH  
2.3 IMO/UN Designation: 4.3/1414  
2.4 DOT ID No.: 1414  
2.5 CAS Registry No.: 7580-67-8  
2.6 NAERG Guide No.: 138  
2.7 Standard Industrial Trade Classification: 52495

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubberized gloves; flame proof outer clothing; respirator; high boots or shoes
- 3.2 **Symptoms Following Exposure:** Inhalation of dust causes coughing, sneezing, and burning of nose and throat. Ingestion causes severe burns of mouth and stomach; symptoms of central nervous system damage may occur. Contact with eyes or skin causes severe caustic burns.
- 3.3 **Treatment of Exposure:** Lithium hydride burns of the eyes, skin, or respiratory tract appear to be worse than those caused by an equivalent amount of sodium hydroxide. INHALATION: remove victim to fresh air; if irritation persists get medical attention at once. INGESTION: give large volumes of water and milk; gastric lavage may be indicated. EYES: flush with copious quantities of running water for at least 15 min.; get medical attention. SKIN: flush with water; treat as a caustic burn.
- 3.4 TLV-TWA: 0.025 mg/m<sup>3</sup>  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 0.5 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 0.025 mg/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Dry nitrogen, graphite, or lithium chloride
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Never use water, foam, halogenated hydrocarbons, soda acid, dry chemical, or carbon dioxide.
- 4.5 **Special Hazards of Combustion**  
Products: Irritating alkali fumes may form in fire.
- 4.6 **Behavior in Fire:** May decompose when hot to form flammable hydrogen gas. Reacts violently with water to produce hydrogen, which may explode in air.
- 4.7 **Auto Ignition Temperature:** 392°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 2.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 1.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently with water to form flammable hydrogen gas and a strong caustic solution; ignition may occur, especially with powder.
- 5.2 **Reactivity with Common Materials:** May ignite combustible materials if they are damp
- 5.3 **Stability During Transport:** Stable, if air and moisture are excluded
- 5.4 **Neutralizing Agents for Acids and Caustics:** Residues should be washed well with water, then rinsed with dilute acetic acid.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 96.5%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Inerted
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Dangerous When Wet
- 8.2 **49 CFR Class:** 4.3
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 4              |
| Instability (Yellow)..... | 2              |
| Special (White).....      | W              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 7.95
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.78 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** -7,200 Btu/lb = -4,000 cal/g = -170 X 10<sup>3</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# LITHIUM HYDRIDE

LHD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# LEAD IODIDE

LID

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid      Bright Yellow      Odorless

Sinks in water.

**KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.**  
Wear dust respirator.  
Notify local health and pollution control agencies.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
POISONOUS IF INHALED.  
If inhaled will cause dizziness or loss of consciousness.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

SOLID  
Irritating to skin and eyes.  
If swallowed will cause nausea, vomiting or loss of consciousness.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Dangerous to aquatic life in high concentrations.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: PbI<sub>2</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2291  
2.5 CAS Registry No.: 10101-63-0  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask and protective gloves.
- 3.2 **Symptoms Following Exposure:** Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders, colic, constipation, etc.; weakness, which may go on to paralysis, chiefly of the extensor muscles of the wrists and less often the ankles, is noticeable in the most serious cases. Ingestion of a large amount causes local irritation of the alimentary tract. Pain, leg cramps, muscle weakness, paresthesias, depression, coma, and death may follow in 1 or 2 days. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** Remove at once all cases of lead intoxication from further exposure until the blood level is reduced to a safe value; immediately place the individual under medical care.  
INGESTION: give gastric lavage using 1% solution of sodium or magnesium sulfate; leave 15-30 mg magnesium sulfate in 6-8 oz. of water in the stomach as antidote and cathartic; egg white, milk, and tannin are useful demulcents; atropine sulfate and other antispasmodics may relieve abdominal pain, but morphine may be necessary. EYES or SKIN: flush with water.
- 3.4 **TLV-TWA:** 0.05 mg/m<sup>3</sup> (as lead)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 100 mg Pb/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 0.05 mg/m<sup>3</sup> (as lead).  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Currently not available 6.6  
Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** May be toxic
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Bioconcentrative
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98.5+%; NF
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 461.03
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 6.16 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 17.9 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# LEAD IODIDE

LID

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.045		N		N		N
36	0.047		O		O		O
38	0.048		T		T		T
40	0.050						
42	0.051		P		P		P
44	0.053		E		E		E
46	0.054		R		R		R
48	0.056		T		T		T
50	0.057		I		I		I
52	0.058		N		N		N
54	0.060		E		E		E
56	0.061		N		N		N
58	0.063		E		E		E
60	0.064		N		N		N
62	0.066		T		T		T
64	0.067						
66	0.069						
68	0.070						
70	0.071						
72	0.073						
74	0.074						
76	0.076						
78	0.077						
80	0.079						
82	0.080						
84	0.082						

# LATEX, LIQUID SYNTHETIC

LLS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Plastic latex Synthetic rubber latex		Liquid White  Mixes with water.
Notify local health and pollution control agencies.		
<b>Fire</b>	Not flammable. Combustible solid is produced when heated.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to eyes. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 43; Water solutions  
2.2 **Formula:** Not pertinent  
2.3 **IMO/IUN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 23200

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical goggles or face shield.  
3.2 **Symptoms Following Exposure:** Irritation of eyes.  
3.3 **Treatment of Exposure:** Flush eyes with water for at least 15 min.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** None  
3.11 **Liquid or Solid Characteristics:** Contact with eyes can cause irritation.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable unless coagulated.  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** If the latex dries out and then burns, hydrochloric acid, hydrogen cyanide and styrene gases may be evolved. All are irritating and poisonous.  
4.6 **Behavior in Fire:** Heat may coagulate the latex and form sticky plastic lumps which may burn.  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Coagulated by heat and acids to gummy, flammable material.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 1%, 5 days  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** All commercial latexes are shipped in a variety of concentrations in water, depending on the particular polymer involved and the intended use of the latex. None are particularly hazardous except in fires, where all coagulate to gummy, flammable material.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Very high  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.057 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# LATEX, LIQUID SYNTHETIC

LLS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	65.790	42	0.478		N		N
44	65.790	44	0.478		O		O
46	65.790	46	0.478		T		T
48	65.790	48	0.478				
50	65.790	50	0.478		P		P
52	65.790	52	0.478		E		E
54	65.790	54	0.478		R		R
56	65.790	56	0.478		T		T
58	65.790	58	0.478		I		I
60	65.790	60	0.478		N		N
62	65.790	62	0.478		E		E
64	65.790	64	0.478		N		N
66	65.790	66	0.478		T		T
68	65.790	68	0.478				
70	65.790	70	0.478				
72	65.790	72	0.478				
74	65.790	74	0.478				
76	65.790	76	0.478				
		78	0.478				
		80	0.478				
		82	0.478				
		84	0.478				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# LIQUEFIED NATURAL GAS

LNG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> LNG	Gas Colorless Odorless or weak skunk odor  Floats and boils on water. Flammable visible vapor cloud is produced.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Evacuate area in case of large discharge.</b> <b>Avoid contact with liquid.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. May explode if ignited in an enclosed area. Stop discharge if possible. Cool exposed area and men effecting shutoff with water. Let fire burn.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Not irritating to eyes, nose or throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 31; Paraffin
- 2.2 Formula:  $CH_4 + C_2H_6$
- 2.3 IMO/UN Designation: 2.0/1058
- 2.4 DOT ID No.: 1972
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 115
- 2.7 Standard Industrial Trade Classification: 34000

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; protective clothing if exposed to liquid.
- 3.2 **Symptoms Following Exposure:** If concentration of gas is high enough, may cause asphyxiation. No detectable systemic effects, even at 5% concentration in air.
- 3.3 **Treatment of Exposure:** Remove victim to open air. If he is overcome by gas, apply artificial resuscitation.
- 3.4 **TLV-TWA:** Currently not available
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly. May cause some frostbite.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Flammable gas
- 4.2 **Flammable Limits in Air:** 5.3%-14.0%
- 4.3 **Fire Extinguishing Agents:** Do not extinguish large spill fires. Allow to burn while cooling adjacent equipment with water spray. Shut off leak if possible. Extinguish small fires with dry chemicals.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 999°F
- 4.8 **Electrical Hazards:** Class I, Group D
- 4.9 **Burning Rate:** 12.5 mm/min.
- 4.10 **Adiabatic Flame Temperature:** 2339. (Est.)
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Varies with the point of origin. Usually contains at least 90% methane, with smaller quantities of ethane, propane, butanes and pentanes, carbon dioxide and nitrogen.
- 7.2 **Storage Temperature:** -260°F (-162°C)
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2.1
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** >16
- 9.3 **Boiling Point at 1 atm:** -258°F = -161°C = 112°K
- 9.4 **Freezing Point:** -296°F = -182.2°C = 91.0°K
- 9.5 **Critical Temperature:** -116°F = -82.2°C = 191.0°K
- 9.6 **Critical Pressure:** 673 psia = 45.78 atm = 4.64 MN/m
- 9.7 **Specific Gravity:** (liquid) 0.415-0.45 at -162°C
- 9.8 **Liquid Surface Tension:** 14 dynes/cm = 0.014 N/m at -161°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 0.55 - 1.0
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.306
- 9.12 **Latent Heat of Vaporization:** (est.) 220 Btu/lb = 120 cal/g = 5.1 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -21,600 to -23,400 Btu/lb = -12,000 to -13,000 cal/g = -502.4 to -544.3 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** High "Physical properties apply to methane; no "standard" LNG exists.

## NOTES

# LIQUEFIED NATURAL GAS

LNG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-290	27.370	-290	0.802		N	-290	0.290
-288	27.270	-285	0.808		O	-285	0.254
-286	27.170	-280	0.815		T	-280	0.225
-284	27.080	-275	0.821			-275	0.200
-282	26.980	-270	0.827		P	-270	0.179
-280	26.880	-265	0.833		E	-265	0.161
-278	26.790	-260	0.839		R	-260	0.146
-276	26.690				T		
-274	26.590				I		
-272	26.490				N		
-270	26.400				E		
-268	26.300				N		
-266	26.200				T		
-264	26.110						
-262	26.010						
-260	25.910						
-258	25.820						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	-290	2.640	-290	0.02464	0	0.475
	N	-288	3.006	-288	0.02773	25	0.484
	S	-286	3.412	-286	0.03111	50	0.493
	O	-284	3.861	-284	0.03480	75	0.502
	L	-282	4.355	-282	0.03882	100	0.511
	U	-280	4.898	-280	0.04318	125	0.520
	B	-278	5.494	-278	0.04790	150	0.530
	L	-276	6.146	-276	0.05300	175	0.539
	E	-274	6.858	-274	0.05849	200	0.549
		-272	7.633	-272	0.06441	225	0.559
		-270	8.474	-270	0.07076	250	0.570
		-268	9.387	-268	0.07756	275	0.580
		-266	10.370	-266	0.08483	300	0.591
		-264	11.440	-264	0.09259	325	0.602
		-262	12.590	-262	0.10090	350	0.613
		-260	13.820	-260	0.10970	375	0.624
		-258	15.150	-258	0.11900	400	0.636
		-256	16.570	-256	0.12890	425	0.647
		-254	18.100	-254	0.13930	450	0.659
		-252	19.720	-252	0.15040	475	0.671
		-250	21.460	-250	0.16210	500	0.684
		-248	23.310	-248	0.17440	525	0.696
		-246	25.270	-246	0.18730	550	0.709
		-244	27.360	-244	0.20090	575	0.721
		-242	29.580	-242	0.21520	600	0.735
		-240	31.920	-240	0.23010		

# LACTONITRILE SOLUTION (80% OR LESS)

LNI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetocyanohydrin 2-Hydroxypropionitrile		Liquid	Straw colored
Wear full impervious protective clothing and approved respirator. Notify local health and pollution control agencies.			
<b>Fire</b>	May be combustible, depending upon concentration. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID. POISON.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 37; Nitriles
- 2.2 Formula:  $\text{CH}_3\text{CH}(\text{OH})\text{CN}$
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: Not listed.
- 2.5 CAS Registry No.: 78-97-7
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51484

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Poison. Toxic by inhalation, ingestion, or skin absorption.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral rat  $\text{LD}_{50}$  = 87 mg/kg.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available.
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.
- 4.5 **Special Hazards of Combustion**  
Products: Irritating vapors and toxic gases, such as nitrogen oxides and carbon monoxide, may be formed when involved in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 22.6 (calc. for pure material)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.5 (calc. for pure material)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Evolves hydrocyanic acid in presence of alkali.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Pressure vacuum valve.
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	2
Instability (Yellow).....	1
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 71.09
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** Currently not available
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# LACTONITRILE SOLUTION (80% OR LESS)

LNI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# LEAD NITRATE

LNT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nitric acid, lead II salt	Solid  White  Odorless  Sinks and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear dust respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. If inhaled will cause dizziness or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** Pb(NO<sub>3</sub>)<sub>2</sub>  
2.3 **IMO/UN Designation:** 5.1/1469  
2.4 **DOT ID No.:** 1469  
2.5 **CAS Registry No.:** 18256-98-9  
2.6 **NAERG Guide No.:** 141  
2.7 **Standard Industrial Trade Classification:** 52359

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask and protective gloves  
3.2 **Symptoms Following Exposure:** Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders, colic, constipation, etc.; weakness, which may go on to paralysis, chiefly of the extensor muscles of the wrists and less often the ankles, is noticeable in the most serious cases. Ingestion of a large amount causes local irritation of the alimentary tract; pain, leg cramps, muscle weakness, paresthesias, depression, coma, and death may follow in 1 or 2 days. Contact with eyes causes irritation.  
3.3 **Treatment of Exposure:** Remove at once all cases of lead intoxication from further exposure until the blood level is reduced to a safe value; immediately place the individual under medical care.  
INGESTION: give gastric lavage using 1% solution of sodium or magnesium sulfate; leave 15-30 gm magnesium sulfate in 6-8 oz. of water in the stomach as antidote and cathartic; egg white, milk, and tannin are useful demulcents; atropine sulfate and other antispasmodics may relieve abdominal pain, but morphine may be necessary. EYES or SKIN: flush with water.  
3.4 **TLV-TWA:** 0.05 mg/m<sup>3</sup> (as lead)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 100 mg Pb/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 0.05 mg/m<sup>3</sup> (as lead)  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.  
4.6 **Behavior in Fire:** Increases the intensity of a fire when in contact with burning material. Use plenty of water to cool containers or spilled material.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Contact with wood and paper may cause fire.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.6 ppm\*/tadpole/harms growth/tap water  
200 mg/l\*/eggs of  
urchins/abnormalities/salt water  
240 ppm/48 hr/mosquito fish/TL<sub>50</sub>/fresh water  
\*Time period not specified.  
6.2 **Waterfowl Toxicity:** May be toxic  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:**  
Both fish and animals can concentrate lead.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent; Technical, 98+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer  
8.2 **49 CFR Class:** 5.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0 1
Flammability (Red).....	0 0
Instability (Yellow).....	0 0
Special (White).....	OX OX

  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 331.2  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 4.53 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** 41 Btu/lb = 23 cal/g = 0.96 X 10<sup>3</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# LEAD NITRATE

LNT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	39.780		N		N		N
36	40.760		O		O		O
38	41.750		T		T		T
40	42.730						
42	43.710		P		P		P
44	44.700		E		E		E
46	45.680		R		R		R
48	46.660		T		T		T
50	47.650		I		I		I
52	48.630		N		N		N
54	49.610		E		E		E
56	50.600		N		N		N
58	51.580		E		E		E
60	52.560		N		N		N
62	53.550		T		T		T
64	54.530						
66	55.510						
68	56.500						
70	57.480						
72	58.460						
74	59.450						
76	60.430						
78	61.410						
80	62.400						
82	63.380						
84	64.360						

# LIQUEFIED PETROLEUM GAS

LPG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bottled gas LPG Propane-butane-(propylene) Pyrofax	Gas  Colorless  Weak odor; may have skunk odor added  Floats and boils on water. Flammable vapor cloud is produced.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Evacuate area in case of large discharge.</b> <b>Avoid contact with liquid.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Containers may explode in fire. May explode if ignited in an enclosed area. Stop discharge if possible. Cool exposed containers and protect men effecting shutoff with water. Let fire burn.
<b>Exposure</b>	VAPOR Not irritating to eyes, nose and throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. CALL FOR MEDICAL AID.  LIQUID Will cause frostbite. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_3H_8-C_4H_{10}-C_3H_6$  (mixture)
- 2.3 IMO/UN Designation: 2.0/1075
- 2.4 DOT ID No.: 1075
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 115
- 2.7 Standard Industrial Trade Classification: 34000

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus for high concentrations of gas.
- 3.2 **Symptoms Following Exposure:** Concentrations in air greater than 10%; cause dizziness in a few minutes, 1% concentrations give the same symptom in 10 min. High concentrations cause asphyxiation.
- 3.3 **Treatment of Exposure:** Remove victim to open air. If he is overcome by gas, apply artificial resuscitation. Guard against self-injury if confused.
- 3.4 **TLV-TWA:** 1,000 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly. May cause frostbite.
- 3.12 **Odor Threshold:** 5000-20,000 ppm
- 3.13 **IDLH Value:** 2,000 ppm
- 3.14 **OSHA PEL-TWA:** 1,000 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Propane: -156°F.C.; butane: -76°F.C.
- 4.2 **Flammable Limits in Air:** Propane: 2.2%-9.5%; butane: 1.8%-8.4%
- 4.3 **Fire Extinguishing Agents:** Allow to burn while cooling adjacent equipment with water spray. Extinguish small fires with dry chemicals. Shut off leak if possible.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water (let fire burn)
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode in fire. Vapor heavier than air and may travel a long distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** Propane: 871°F; butane: 761°F
- 4.8 **Electrical Hazards:** Class I, Group D
- 4.9 **Burning Rate:** 8.2 mm/min.
- 4.10 **Adiabatic Flame Temperature:** 2419. (Est.)
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Various grades, mostly propane. In some areas propylene may be included. The proportion may be varied with the season.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2.1
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** >44
- 9.3 **Boiling Point at 1 atm:** > -40°F = > -40°C = > 233°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** -142.01°F = -96.67°C = 176.53°K
- 9.6 **Critical Pressure:** 616.5 psia = 41.94 atm = 4.249 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.51 0.58 at -50°C (liquid)
- 9.8 **Liquid Surface Tension:** 16 dynes/cm = 0.016 N/m at -47°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at -38°C
- 9.10 **Vapor (Gas) Specific Gravity:** 1.5
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.130
- 9.12 **Latent Heat of Vaporization:** 183.2 Btu/lb = 101.8 cal/g = 4.262 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -19,782 Btu/lb = -10,990 cal/g = 460.13 X 10<sup>6</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** High "Physical properties apply to propane. No "standard" LPG exists.

### NOTES

# LIQUEFIED PETROLEUM GAS

LPG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-180	36.490	-50	0.546		N	-145	0.433
-175	36.300	-40	0.560		O	-140	0.413
-170	36.110	-30	0.574		T	-135	0.395
-165	35.920	-20	0.588			-130	0.378
-160	35.730	-10	0.602		P	-125	0.362
-155	35.540	0	0.615		E	-120	0.347
-150	35.340	10	0.629		R	-115	0.333
-145	35.150	20	0.643		T	-110	0.321
-140	34.960	30	0.657		I	-105	0.309
-135	34.770	40	0.671		N	-100	0.297
-130	34.580	50	0.685		E	-95	0.287
-125	34.390	60	0.699		N	-90	0.277
-120	34.200	70	0.713		T	-85	0.268
-115	34.010	80	0.727			-80	0.259
-110	33.820	90	0.740			-75	0.251
-105	33.630	100	0.754			-70	0.243
-100	33.440	110	0.768			-65	0.236
-95	33.250	120	0.782			-60	0.229
-90	33.060					-55	0.222
-85	32.870					-50	0.216
-80	32.670					-45	0.210
-75	32.480					-40	0.204
-70	32.290						
-65	32.100						
-60	31.910						
-55	31.720						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	-230	0.002	-230	0.00003	0	0.350
	N	-220	0.004	-220	0.00007	25	0.366
	S	-210	0.009	-210	0.00015	50	0.382
	O	-200	0.019	-200	0.00031	75	0.398
	L	-190	0.039	-190	0.00060	100	0.414
	U	-180	0.074	-180	0.00109	125	0.430
	B	-170	0.134	-170	0.00189	150	0.445
	L	-160	0.230	-160	0.00315	175	0.460
	E	-150	0.380	-150	0.00503	200	0.475
		-140	0.605	-140	0.00775	225	0.490
		-130	0.931	-130	0.01158	250	0.505
		-120	1.393	-120	0.01681	275	0.520
		-110	2.029	-110	0.02379	300	0.534
		-100	2.886	-100	0.03289	325	0.549
		-90	4.017	-90	0.04454	350	0.563
		-80	5.480	-80	0.05917	375	0.577
		-70	7.344	-70	0.07725	400	0.591
		-60	9.680	-60	0.09927	425	0.605
		-50	12.570	-50	0.12570	450	0.618
		-40	16.090	-40	0.15710	475	0.632
		-30	20.340	-30	0.19400	500	0.645
		-20	25.400	-20	0.23680	525	0.658
						550	0.671
						575	0.684
						600	0.696



# LAUROYL PEROXIDE

LPO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dilauroyl peroxide Dodecanoyl peroxide	Solid  White  Faint soapy odor  Floats on water.
Evacuate. Keep people away. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. May cause fire on contact with combustibles. Containers may explode in fire. May explode if exposed to heat or flames. Combat fires from behind barrier. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $[\text{CH}_3(\text{CH}_2)_{10}\text{COO}]_2$   
2.3 IMO/UN Designation: 5.2/2124  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 105-74-8  
2.6 NAERG Guide No.: 145  
2.7 Standard Industrial Trade Classification: 51699

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves, goggles  
3.2 **Symptoms Following Exposure:** Contact with liquid irritates eyes and skin. Ingestion causes irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** EYES: wash with plenty of water for 15 min. and get medical attention.  
SKIN: wash with plenty of soap and water. INGESTION: administer an emetic to induce vomiting and call a physician  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Weak carcinogen in mice  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (oxidizing combustible solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Can increase the severity of a fire. Becomes sensitive to shock when hot. Containers may explode in a fire. May ignite or explode spontaneously if mixed with flammable materials.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 159.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 47.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May ignite or explode spontaneously when mixed with combustible materials.  
5.3 **Stability During Transport:** Stable if not overheated  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97-98%; dry or wetted with water  
7.2 **Storage Temperature:** <80°F  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	3
Special (White).....	OX

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 399  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** 129°F = 54°C = 327°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.91 at 25°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -16,300 Btu/lb  
-9,100 cal/g = -380 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# LAUROYL PEROXIDE

LPO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# LAURIC ACID

LRA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> C-1297 n-Dodecanoic acid Duodecyllic acid Hydrofol acid 1255 or 1295 Hystrene 9512 Laurostearic acid Neo-fat 12 Neo-fat 12-43	Solid  White  Slight odor of bay oil
<p>Keep people away. Avoid contact with solution and vapor.  Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.  Call fire department.  Notify local health and pollution control agencies.</p>	
<b>Fire</b>	Combustible. Water may be ineffective on fire. Wear self contained breathing apparatus and protective clothing. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> .
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR, AEROSOL MIST OR DUST Irritating to eyes, mucous membranes, nose and throat. If inhaled will cause coughing or difficult breathing. IF IN EYES, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID (SOLUTION) Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	May be dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 4; Organic acids
- 2.2 Formula: CH<sub>3</sub>(CH<sub>2</sub>)<sub>10</sub>CO<sub>2</sub>H
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 143-07-7
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respirator, chemical safety goggles, boots and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion or skin absorption. Vapor or mist is irritating to eyes, mucous membrane and upper respiratory tract. Causes eye and skin irritation.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove victim to fresh air. If not breathing give artificial respiration. If breathing is difficult give oxygen. EYES: Flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with the fingers. SKIN: Wash with soap and copious amounts of water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 12 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors or mists cause severe irritation and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available.
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** >230°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam, water spray.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** May cause dust explosion.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 80.9 (calc.)
- 4.12 **Flame Temperature:** Data not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 24.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Cautics:** Sodium bicarbonate solution; flush with water.
- 5.5 **Polymerization:** Will not occur
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 200.32
- 9.3 **Boiling Point at 1 atm:** 437°F = 225°C = 498.2°K (at 100 mm.Hg = 0.132atm)
- 9.4 **Freezing Point:** 111.2-114.8°F = 44-46°C = 317.2-319.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.883
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 6.91
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# LAURIC ACID

LRA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	250 303 331 362 395 410 415 442 482 525 571	0.019 0.097 0.193 0.387 0.774 0.967 1.160 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.326 0.340 0.353 0.366 0.379 0.392 0.404 0.416 0.428 0.440 0.452 0.463 0.474 0.485 0.495 0.506 0.516 0.526 0.536 0.546 0.555 0.564 0.573 0.582 0.591

# LAURYL MERCAPTAN

LRM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Dodecanethiol Dodecyl mercaptan	Oily liquid Colorless Mild skunk odor  Floats on water. Freezing point is 19°F.
<b>Keep people away.</b> <b>Wear goggles and self-contained breathing apparatus.</b> <b>Avoid contact with liquid.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. If swallowed, will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_{10}\text{CH}_2\text{SH}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respirator when mist is present; rubber or vinyl gloves; chemical goggles; rubber shoes and apron.
- 3.2 **Symptoms Following Exposure:** Liquid is irritating to skin, eyes, and mucous membranes. Ingestion may cause nausea. Repeated skin exposure can cause dermatitis and may produce a sensitizing effect.
- 3.3 **Treatment of Exposure:** Get medical attention for all eye exposures and any other serious over-exposures. INHALATION (mist): rinse mouth repeatedly with cold water; treatment is symptomatic. INGESTION: dilute by drinking water; if vomiting occurs, drink more water; administer saline laxative. EYES: flush thoroughly with water; ventilation by electric fan is helpful in removing last traces, especially around eyes and eyelids. SKIN: remove contaminated clothing; flush skin with water; wash exposed area with soap and water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Causes decline in kidney and liver function in rats.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Irritating concentrations of vapor unlikely, but mist can cause irritation of eyes and upper respiratory tract.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 Odor Threshold: 4 mg/m<sup>3</sup>
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 262°F O.C.
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.
- 4.5 Special Hazards of Combustion Products: Poisonous and irritating gases (e.g., sulfur dioxide) are generated in fires.
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 92.8 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 26.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: -  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 95% minimum
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open (flame arrester)
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 202
- 9.3 Boiling Point at 1 atm: Very high
- 9.4 Freezing Point: 19.4°F = -7.0°C = 266.2°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 0.85 at 15°C (liquid)
- 9.8 Liquid Surface Tension: (est.) 30 dynes/cm = 0.03 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension: (est.) 30 dynes/cm = 0.03 N/m at 20°C
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: (est.) 110 Btu/lb = 60 cal/g = 2.5 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: (est.) -18,200 Btu/lb = -10,100 cal/g = -422 X 10<sup>5</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# LAURYL MERCAPTAN

LRM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
51	53.310	50	0.525	50	1.040	60	3.358
52	53.280	52	0.525	52	1.040	70	2.965
53	53.250	54	0.525	54	1.040	80	2.631
54	53.220	56	0.525	56	1.040	90	2.344
55	53.190	58	0.525	58	1.040	100	2.098
56	53.160	60	0.525	60	1.040	110	1.884
57	53.130	62	0.525	62	1.040	120	1.699
58	53.100	64	0.525	64	1.040	130	1.537
59	53.070	66	0.525	66	1.040	140	1.395
60	53.050	68	0.525	68	1.040	150	1.271
61	53.020	70	0.525	70	1.040	160	1.161
62	52.990	72	0.525	72	1.040	170	1.063
63	52.960	74	0.525	74	1.040	180	0.977
64	52.930	76	0.525	76	1.040	190	0.900
65	52.900	78	0.525	78	1.040	200	0.831
66	52.870	80	0.525	80	1.040	210	0.769
67	52.840	82	0.525	82	1.040		
68	52.810	84	0.525	84	1.040		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	50	0.000	50	0.00002		N
	N	52	0.001	52	0.00002		O
	S	54	0.001	54	0.00002		T
	O	56	0.001	56	0.00002		
	L	58	0.001	58	0.00002		P
	U	60	0.001	60	0.00003		E
	B	62	0.001	62	0.00003		R
	I	64	0.001	64	0.00003		T
	E	66	0.001	66	0.00003		I
		68	0.001	68	0.00003		N
		70	0.001	70	0.00004		E
		72	0.001	72	0.00004		N
		74	0.001	74	0.00004		T
		76	0.001	76	0.00005		
		78	0.001	78	0.00005		
		80	0.002	80	0.00005		
		82	0.002	82	0.00006		
		84	0.002	84	0.00006		

# LEAD STEARATE

LSA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Neutral lead stearate Stearic acid, lead salt	Solid powder      White      Slight fatty odor
	Sinks in water.
Keep people away. Shut off ignition sources and call fire department. Wear goggles, self-contained breathing apparatus, and protective clothing (including gloves). Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. POISONOUS FUMES PRODUCED AT HIGH TEMPERATURES. Dust may explode at high temperatures or source of ignition. Extinguish with CO <sub>2</sub> or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Move to fresh air. Keep victim quiet and warm.  SOLID If swallowed will cause headache, abdominal pain, nausea and vomiting. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink milk or water, and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Collection Systems: Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: Pb(C <sub>18</sub> H <sub>35</sub> O <sub>2</sub> ) <sub>2</sub> 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 2291 2.5 CAS Registry No.: 7428-48-0 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 51376
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Dust and/or fume respirator, gloves, goggles or safety glasses, coveralls, and cap. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Joint and muscle pains, headache, dizziness, and insomnia. Weakness, frequently of extensor muscles of hand and wrist (unilateral or bilateral). Heavy contamination - brain damage. Stupor progressing to coma - with or without convulsion, often death. Excitation, confusion and mania less common. Cerebrospinal pressure may be increased. INGESTION: Abdominal pain, diarrhea, constipation, loss of appetite, muscular weakness, headache, blue line on gums, metallic taste, nausea, and vomiting. 3.3 <b>Treatment of Exposure:</b> Call a physician. INHALATION: Remove from the source of exposure. Keep victim quiet and warm. EYES: Wash with water for 15 to 20 minutes. SKIN: Wash with soap and water. INGESTION: Call a physician at once. Induce vomiting, give milk and magnesium sulfate (epsom salts). 3.4 <b>TLV-TWA:</b> 0.05 mg/m <sup>3</sup> as Pb. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Currently not available 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Intermittent vomiting, irritability, nervousness, incoordination, vague pains in the arms, legs, joints and abdomen. Sensory disturbances of extremities, paralysis of extensor muscles of arms and legs with wrist and foot drop. Disturbance of menstrual cycle, and abortion. Periods of stupor or lethargy, encephalopathy (with visual disturbances), elevated blood pressure, papilledema, cranial nerve paralysis delirium, convulsions and coma. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 100 mg Pb/m <sup>3</sup> 3.14 <b>OSHA PEL-TWA:</b> 0.05 mg/m <sup>3</sup> (as lead). 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** >450°F O.C.  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Chemical, foam, CO<sub>2</sub>, water (fog)  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** At high temperature toxic fumes are emitted.  
4.6 **Behavior in Fire:** Possibility of explosion exists under dusty conditions  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Will not occur  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Lead stearate practically insoluble in water. The following are data for the lead ion.  
2.4 ppm/96-hour/TL<sub>m</sub>/Minnow/soft water  
75 ppm/96-hour/TL<sub>m</sub>/Minnow/hard water  
69 ppm/96-hour/TL<sub>m</sub>/Bluegill/hard water  
1.4 ppm/18-hour/lethal/Trout/soft water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Fish and animal life are capable of lead concentration.  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 29.5% PbO  
7.2 **Storage Temperature:** Cool  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 774.17  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** 240.3°F = 115.7°C = 388.9°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.34 - 1.4  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 26.7 (calculated)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# LEAD STEARATE

LSA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
96	0.050		C		C		C
98	0.051		U		U		U
100	0.052		R		R		R
102	0.053		R		R		R
104	0.053		E		E		E
106	0.054		N		N		N
108	0.055		T		T		T
110	0.056		L		L		L
112	0.056		L		L		L
114	0.057						
116	0.058		N		N		N
118	0.059		O		O		O
120	0.059		T		T		T
122	0.060						
			A		A		A
			V		V		V
			A		A		A
			I		I		I
			L		L		L
			A		A		A
			B		B		B
			L		L		L
			E		E		E



# LEAD SULFATE

LSF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Anglisite Fast white Freemans white lead Lanarkite Lead bottoms Milk white Pigment white 3	Solid powder      White      Odorless  Sinks in water.
Keep people away. Avoid contact with solid and dust. Wear goggles, self-contained breathing apparatus and rubber gloves. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST OR SOLID POISONOUS IF INHALED. Irritating to eyes. If swallowed will cause abdominal pain, nausea, vomiting, headache and muscular weakness. Move to fresh air. IF IN EYES, hold eyelids open and flush with plenty of water. Flush affected areas with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{PbSO}_4$   
2.3 IMO/UN Designation: 8/1794 (only if substance contains more than 3% free acid)  
2.4 DOT ID No.: 1794  
2.5 CAS Registry No.: 7446-14-2  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 52349

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear approved filter mask, rubber gloves, and safety glasses.  
3.2 **Symptoms Following Exposure:** INHALATION: Joint and muscle pains, headache, dizziness and insomnia. Weakness, frequently of extensor muscles of hand and wrist (unilateral or bilateral). Heavy contamination. Brain damage. Stupor progressing to coma - with or without convulsion, often death. Excitation, confusion, and mania less common. Cerebrospinal pressure may be increased. EYES: Caused a moderate purulent reaction and general inflammation of the rabbit eye. INGESTION: Abdominal pain, diarrhea, constipation, loss of appetite, muscular weakness, headache, blue line on gums, metallic taste, nausea and vomiting.  
3.3 **Treatment of Exposure:** Get medical aid. INHALATION: Remove from source of exposure and keep quiet. EYES: Wash with running water. SKIN: Wash with soap and water. INGESTION: Wash mouth, give emetic then epsom salts (30 g/250 ml hot water); get medical attention.  
3.4 **TLV-TWA:** 0.05 mg/m<sup>3</sup> (as lead)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD50 = 50 to 500 mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Intermittent vomiting, irritability, nervousness, incoordination, vague pains in the arms, legs, joints, and abdomen. Sensory disturbances of extremities, paralysis of extensor muscles of arms and legs with wrist and foot drop. Disturbance of menstrual cycle, and abortion. Periods of stupor or lethargy, encephalopathy (with visual disturbances), elevated blood pressure, papilledema, cranial nerve paralysis, delirium, convulsions, and coma.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 100 mg Pb/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 0.05 mg/m<sup>3</sup> (as lead).  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic metal fumes  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Currently not available  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
25 ppm/96-hour/Goldfish/lethal concentration/distilled water  
25 ppm/2-to 3-hour/Minnow/lethal concentration/distilled water  
2.4 ppm/96-hour/Fathead minnow/TL<sub>m</sub>/soft water  
75 ppm/96-hour/Fathead minnow/TL<sub>m</sub>/hard water  
0.1 ppm/chronic aquatic toxicity limits  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Fish and animal life are capable of lead concentration.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 83.2% to 88.7% PbO  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 303.28  
9.3 Boiling Point at 1 atm: Currently not available  
9.4 Freezing Point: 2138°F = 1170°C = 1443.2°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 6.2 at room temperature  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 10.46 (calculated)  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: 31.6 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# LEAD SULFATE

LSF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
35	0.003		C		C		C
40	0.003		U		U		U
45	0.003		R		R		R
50	0.003		R		R		R
55	0.004		E		E		E
60	0.004		N		N		N
65	0.004		T		T		T
70	0.004		L		L		L
75	0.004		L		L		L
80	0.005						
85	0.005		N		N		N
90	0.005		O		O		O
95	0.005		T		T		T
100	0.005		A		A		A
			V		V		V
			A		A		A
			I		I		I
			L		L		L
			A		A		A
			B		B		B
			L		L		L
			E		E		E

# LEAD SULFIDE

LSU

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Galena Plumbous sulfide	Solid, powder or crystal  Black, silver  Sinks in water.
Keep people away. AVOID CONTACT WITH POWDER OR DUST. Wear goggles, self-contained breathing apparatus, rubber overclothing (including gloves). Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. Poisonous and irritating gases produced when heated. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST. POISONOUS IF INHALED. Irritating to skin and eyes. Move to fresh air. IF IN EYES, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID. POISONOUS IF SWALLOWED. Flush affected areas with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS or having CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: PbS  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2291  
2.5 CAS Registry No.: 1314-87-0  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 52342

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective clothing, rubber gloves, safety goggles, or face mask and an approved respirator.
- 3.2 **Symptoms Following Exposure:** INHALATION OR INGESTION: Abdominal pain, loss of appetite, weight loss, constipation, apathy or irritability, vomiting, fatigue, headache, weakness metallic taste and muscle incoordination. Lead line on gums. EYES: Irritation. May cause corneal destruction. SKIN: Pain and severe burns.
- 3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from exposure. EYES: Flush with running water. SKIN: Wash with soap and water. INGESTION: Gastric lavage if vomiting is not extensive. Give egg white or milk as demulcent.
- 3.4 **TLV-TWA:** 0.05 mg/m<sup>3</sup> (as lead).
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> 5-15 g/kg.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Accumulative poison; repeated exposure can lead to damage to the liver, kidney, blood and nervous system. A suspected carcinogen of the lungs and kidney. Some evidence of teratogenic effects in laboratory animals.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 100 mg Pb/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 0.05 mg/m<sup>3</sup> (as lead).
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Use appropriate media to suppress exposure fire.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** At fire temperatures emits highly toxic and irritating sulfur oxides.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** > 1000 ppm/96 hr/fish/TL<sub>m</sub>
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Positive, is concentrated in the food chain.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: /D  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 239.27.
- 9.3 **Boiling Point at 1 atm:** 2337.8°F = 1281°C = 1554.2°K.
- 9.4 **Freezing Point:** 2037.2°F = 1114°C = 1387.2°K.
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 7.5 at 20°C.
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 8.25 (calculated).
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 17.3 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# LEAD SULFIDE

LSU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
64	0.009		N		N		N
65	0.009		O		O		O
66	0.008		T		T		T
67	0.007						
68	0.007		P		P		P
69	0.006		E		E		E
70	0.005		R		R		R
71	0.005		T		T		T
72	0.004		I		I		I
73	0.003		N		N		N
74	0.003		E		E		E
75	0.002		N		7		N
76	0.002		E		*		E
77	0.001		N		>		N
			T		3		T

# LACTIC ACID

LTA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Hydroxypropanoic acid alpha-Hydroxypropionic acid Milk acid Racemic lactic acid	Thick liquid  Colorless to yellow  Weak unpleasant odor  Sinks and Mixes with water.
Keep people away. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{CHOHCOOH}\cdot\text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 50-21-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51391

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; goggles; self-contained breathing apparatus where high concentrations of mist are present  
3.2 **Symptoms Following Exposure:** Inhalation of mist causes coughing and irritation of mucous membranes. Ingestion, even of diluted preparations, has a corrosive effect on the esophagus and stomach. Contact with more concentrated solutions can cause severe burns of skin or eye.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water. EYES: flush with water for at least 15 min. SKIN: flush with water; wash well with soap and water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 1,810 \text{ mg/kg}$  (guinea pig)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (not flammable, or burns with difficulty)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Slowly corrodes most metals  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water; rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
430 ppm/> 100 hr/goldfish/no effect/fresh water  
654 ppm/6 hr/goldfish/killed/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 72%, 5 days  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1/BOD  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** USP; Reagent; Technical, 88%; Food processing, 50%, 80%. The balance is water in all cases.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 90  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.20 at 20° (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -6,520 Btu/lb = -3,620 cal/g = -152 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# LACTIC ACID

LTA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
51	75.500	52	0.549		N	77	40.500
52	75.459	54	0.550		O		
53	75.429	56	0.551		T		
54	75.389	58	0.552				
55	75.360	60	0.553		P		
56	75.320	62	0.554		E		
57	75.290	64	0.555		R		
58	75.250	66	0.556		T		
59	75.219	68	0.557		I		
60	75.179	70	0.558		N		
61	75.150	72	0.559		E		
62	75.110	74	0.560		N		
63	75.080	76	0.561		T		
64	75.049	78	0.562				
65	75.009	80	0.563				
66	74.980	82	0.564				
67	74.940	84	0.565				
68	74.910	86	0.566				
69	74.870						
70	74.839						
71	74.799						
72	74.770						
73	74.730						
74	74.700						
75	74.660						
76	74.629						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# LEAD THIOCYANATE

LTC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lead sulfo cyanate	Solid  White  Odorless  Sinks and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear dust respirator. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. If inhaled will cause dizziness or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Pb(SCN)<sub>2</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2291  
2.5 CAS Registry No.: 592-87-0  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 52382

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders, colic, constipation, etc.; weakness, which may go on to paralysis, chiefly of the extensor muscles of the wrists and less often of the ankles, is noticeable in the most serious cases. Ingestion of a large amount causes local irritation of the alimentary tract; pain, leg cramps, muscle weakness, paresthesias, depression, coma, and death may follow in 1 or 2 days. Contact causes irritation of eyes and mild irritation of skin.  
3.3 **Treatment of Exposure:** Remove at once all cases of lead intoxication from further exposure until the blood level is reduced to a safe value; immediately place the individual under medical care.  
INGESTION: give gastric lavage using 1% solution of sodium or magnesium sulfate; leave 15-30 gm magnesium sulfate in 6-8 oz. of water in the stomach as antidote and cathartic; egg white, milk, and tannin are useful demulcents; atropine sulfate and other antispasmodics may relieve abdominal pain, but morphine may be necessary. EYES: flush with water for at least 15 min.  
SKIN: wash well with soap and water.  
3.4 **TLV-TWA:** 0.05 mg/m<sup>3</sup> (as lead)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 100 mg Pb/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 0.05 mg/m<sup>3</sup> (as lead).  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating sulfur dioxide gas may form in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** May be toxic  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Bioconcentrative  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Practical; Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 323.4  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 3.82 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# LEAD THIOCYANATE

LTC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.102		N		N		N
36	0.124		O		O		O
38	0.147		T		T		T
40	0.169						
42	0.191		P		P		P
44	0.213		E		E		E
46	0.235		R		R		R
48	0.258		T		T		T
50	0.280		I		I		I
52	0.302		N		N		N
54	0.324		E		E		E
56	0.347		N		N		N
58	0.369		T		T		T
60	0.391						
62	0.413						
64	0.435						
66	0.458						
68	0.480						
70	0.502						
72	0.524						
74	0.547						
76	0.569						
78	0.591						
80	0.613						
82	0.635						
84	0.658						



## LITHARGE

LTH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lead monoxide Lead oxide yellow Lead protoxide Massicot Plumbous oxide	Solid          Sinks in water.	Gray or yellow green or red-brown	Odorless
Keep people away. Notify local health and pollution control agencies.			
<b>Fire</b>	Not flammable.		
<b>Exposure</b>	Call for medical aid.  SOLID OR DUST Irritating to eyes. Harmful if inhaled. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: PbO  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2291  
2.5 CAS Registry No.: 1317-36-8  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 52257

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust or metal fume respirator; gloves; goggles.  
3.2 **Symptoms Following Exposure:** General symptoms of lead poisoning (delayed). Inhalation or ingestion causes abdominal pain (lead colic), metallic taste in mouth, loss of weight, pain in muscles, and muscular weakness. Dust may irritate eyes.  
3.3 **Treatment of Exposure:** Consult physician after ingestion or exposure to high concentrations of dust.  
INGESTION: call physician at once; as first aid, induce vomiting and give milk and magnesium sulfate (Epsom salt).  
3.4 **TLV-TWA:** 0.05 mg/m<sup>3</sup> as lead  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Impairs development of human fetal connective tissue cells  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 100 mg Pb/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 0.05 mg/m<sup>3</sup> (as lead).  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** > 56,000 ppm/96 hr/mosquito fish/TL<sub>m</sub>/turbid water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Low-metal-content oxides contain 98 to 99.8%. High metal or battery grades contain 50 to 95%. Reagent; purified. Most grades available in several particle sizes.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 223.2  
9.3 **Boiling Point at 1 atm:** Not pertinent (Decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 9.5 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 12.6 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# LITHARGE

LTH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
64	0.007		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# LITHIUM

LTM

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Soft solid White to light silver Odorless

Reacts violently with water. Flammable gas is produced.

Evacuate.  
**KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID.**  
Wear rubber overclothing (including gloves).  
Shut off ignition sources and call fire department.  
Notify local health and pollution control agencies.

### Fire

Combustible.  
Irritating gases may be produced when heated.  
Wear goggles and self-contained breathing apparatus.  
Extinguish with dry graphite, soda ash, or other inert powder.  
**DO NOT USE WATER, FOAM, DRY CHEMICALS OR CARBON DIOXIDE ON FIRE.**  
**DO NOT USE WATER OR FOAM ON ADJACENT FIRES.**

### Exposure

CALL FOR MEDICAL AID.  
**SOLID**  
Will burn skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

## 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** Li  
2.3 **IMO/UN Designation:** 4.3/1415  
2.4 **DOT ID No.:** 1415  
2.5 **CAS Registry No.:** 7439-93-2  
2.6 **NAERG Guide No.:** 138  
2.7 **Standard Industrial Trade Classification:** 52228

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber or plastic gloves; face shield; respirator; fire-retardant clothing  
3.2 **Symptoms Following Exposure:** Contact with eyes causes caustic irritation or burn. Incontact with skin lithium reacts with body moisture to cause chemical burns: foil, ribbon, and wire react relatively slowly.  
3.3 **Treatment of Exposure:** EYES or SKIN: flush with water and treat with boric acid.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent  
4.2 **Flammable Limits in Air:** (combustible solid) Not pertinent  
4.3 **Fire Extinguishing Agents:** Graphite, lithium chloride  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water, sand, halogenated hydrocarbons, carbon dioxide, soda-acid, or dry chemical  
4.5 **Special Hazards of Combustion Products:** Strong alkali fumes are formed in fire.  
4.6 **Behavior in Fire:** Molten lithium is quite easily ignited and is then difficult to extinguish. Hot or burning lithium will react with all gases except those of the helium-argon group. It also reacts violently with concrete, wood, asphalt, sand, asbestos; and in fact, nearly everything except metal. Do not apply water to adjacent fires. Hydrogen explosion may result.  
4.7 **Auto Ignition Temperature:** 354°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently to form flammable hydrogen gas and strong caustic solution. Ignition usually occurs.  
5.2 **Reactivity with Common Materials:** May ignite combustible materials if they are damp.  
5.3 **Stability During Transport:** Stable, if air and moisture are excluded.  
5.4 **Neutralizing Agents for Acids and Caustics:** Residues should be flushed with water, then rinsed with dilute acetic acid.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure, 99.9%; Powder, shot, wire, ribbon, rod.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Inerted  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Dangerous When Wet  
8.2 **49 CFR Class:** 4.3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	2
Special (White).....	W

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 6.939  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.53 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -18,470 Btu/lb = -10,260 cal/g = -429.3 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -31,500 Btu/lb = -17,500 cal/g = -733 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 158.5 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# LITHIUM

LTM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# LEAD THIOSULFATE

LTS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lead hyposulfite Thiosulfuric acid, lead salt		Solid crystals      White  Sinks and mixes slowly with water.
Keep people away. Avoid contact with solid or dust. Wear goggles, self-contained breathing apparatus, rubberoverclothing (including gloves). Notify local health and pollution control agencies.		
<b>Fire</b>	Not flammable. POISONOUS FUMES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.	
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Move to fresh air.  SOLID If swallowed, will cause abdominal pain, diarrhea, weakness, nausea, and vomiting. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: PbS <sub>2</sub> O <sub>3</sub> 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 2291 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 52344
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Rubber gloves, safety glasses, respirator. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Joint and muscle pains, headache, dizziness, and insomnia. Weakness, frequently of extensor muscles of hand and wrist (unilateral or bilateral). Heavy contamination - Brain damage. Stupor progressing to coma - with or without convulsion, often death. Excitation, confusion, and mania less common. Cerebrospinal pressure may be increased. INGESTION: Abdominal pain, diarrhea, constipation, loss of appetite, muscular weakness, headache, blue line on gums metallic taste, nausea and vomiting, joint and muscle pain. 3.3 <b>Treatment of Exposure:</b> Immediately place under medical care. INHALATION: Remove from further exposure. EYES: Flush with copious amounts of water. SKIN: Wash with soap and water. INGESTION: Induce vomiting and follow with gastric lavage at the earliest possible time. Administer a saline cathartic and an enema. 3.4 <b>TLV-TWA:</b> 0.05 mg/m <sup>3</sup> (as lead) 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Currently not available 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Intermittent vomiting, irritability, nervousness, incoordination; vague pains in the arms, legs, joints, and abdomen. Sensory disturbances of extremities, paralysis of extensor muscles of arms and legs with wrist and foot drop. Disturbance of menstrual cycle, and abortion. Periods of stupor or lethargy, encephalopathy (with visual disturbances), elevated blood pressure, papilledema, cranial nerve paralysis, delirium, convulsions, and coma. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 100 mg Pb/m <sup>3</sup> 3.14 <b>OSHA PEL-TWA:</b> 0.05 mg/m <sup>3</sup> (as lead). 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic fumes
- 4.6 **Behavior in Fire:** Can emit toxic metal fumes and oxides of sulfur.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.34 ppm (as Pb)/48-hour  
TL<sub>50</sub>/sticklebacks and coho salmon  
1.4 ppm (as Pb)/48-hour TL<sub>50</sub>/Bluegil sunfish  
2.0 ppm (as Pb)/24-hour TL<sub>50</sub>/Bluegil sunfish
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Animals and fish are capable of concentrating lead.
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Cool - out of direct rays of sun
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 319.33
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** Decomposes at melting point.
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 5.18 at room temperature
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 11.0 (calculated)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# LEAD THIOSULFATE

LTS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# LEAD TETRAACETATE

LTT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lead IV acetate	Wet Crystals Faintly Pink Vinegar-like Odor  Reacts with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID.</b> Wear dust respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID/SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $Pb(C_2H_3O_2)_4 \cdot CH_3COOH$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2291
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 51371

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves
- 3.2 **Symptoms Following Exposure:** Early symptoms of lead intoxication by ingestion are most commonly gastrointestinal disorders, colic, constipation, etc.; weakness, which may go on to paralysis chiefly of the extensor muscles of the wrists and less often of the ankles, is noticeable in the most serious cases. Ingestion of a large amount causes local irritation of the alimentary tract; pain, leg cramps, muscle weakness, paresthesias, depression, coma, and death may follow in 1 or 2 days. Contact causes severe irritation of eyes and can burn skin.
- 3.3 **Treatment of Exposure:** Remove at once all cases of lead intoxication from further exposure until the blood level is reduced to a safe value; immediately place the individual under medical care.  
INGESTION: give gastric lavage using 1% solution of sodium or magnesium sulfate; leave 15-30 gm magnesium sulfate in 6-8 oz. of water in the stomach as antidote and cathartic; egg white, milk, and tannin are useful demulcents; atropine sulfate and other antispasmodics may relieve abdominal pain, but morphine may be necessary. EYES: flush with water for at least 15 min.  
SKIN: wash contaminated skin with large amounts of water for 15 min.
- 3.4 **TLV-TWA:** 0.05 mg/m<sup>3</sup> (as lead)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 100 mg Pb/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 0.05 mg/m<sup>3</sup> (as lead).
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Can increase the intensity of a fire when in contact with combustible material. Cool containers with plenty of water.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Forms lead dioxide and acetic acid in a reaction that is not violent
- 5.2 **Reactivity with Common Materials:** May corrode metals when moist
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water, rinse with dilute sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** May be toxic
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Bioconcentrative
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 80-90%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 443.39
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** 347°F = 175°C = 448°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.2 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# LEAD TETRAACETATE

LTT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# LEAD TUNGSTATE

LTU

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lead wolframate Raspite Scheelite Stolzite		Solid powder      White to pale yellow  Sinks in water.
Keep people away. Avoid contact with solid. Wear goggles, self-contained breathing apparatus, and rubber gloves. Notify local health and pollution control agencies.		
<b>Fire</b>	Not flammable. Toxic metal fumes may be produced in fire. Wear goggles and self-contained breathing apparatus.	
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Move to fresh air.  SOLID If swallowed will cause abdominal pain, diarrhea, weakness, nausea, and vomiting. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $PbWO_4$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2291
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 52499

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, safety glasses, respirator.
- 3.2 **Symptoms Following Exposure:** INHALATION: Joint and muscle pains, headache, dizziness and insomnia. Weakness, frequently of extensor muscles of hand and wrist (unilateral or bilateral). Heavy contamination - Brain damage. Stupor progressing to coma - with or without convulsion, often death. Excitation, confusion, and mania less common. Cerebrospinal pressure may be increased. INGESTION: Abdominal pain, diarrhea, constipation, loss of appetite, muscular weakness, headache, blue line on gums, metallic taste, nausea and vomiting, joint and muscle pain.
- 3.3 **Treatment of Exposure:** Immediately place under medical care. INHALATION: Remove from further exposure. EYES: Flush with copious amounts of water. SKIN: Wash with soap and water. INGESTION: Induce vomiting and follow with gastric lavage at the earliest possible time. Administer a saline cathartic and an enema.
- 3.4 TLV-TWA: 0.05 mg/m<sup>3</sup> (as lead).
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Intermittent vomiting, irritability, nervousness, incoordination; vague pains in the arms, legs, joints, and abdomen. Sensory disturbances of extremities, paralysis of extensor muscles of arms and legs with wrist and foot drop. Disturbance of menstrual cycle, and abortion. Periods of stupor or lethargy, encephalopathy (with visual disturbances), elevated blood pressure, papilledema, cranial nerve paralysis, delirium, convulsions, and coma.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 100 mg Pb/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 0.05 mg/m<sup>3</sup> (as lead).
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic metal fumes
- 4.6 **Behavior in Fire:** Can emit toxic metal fumes.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.34 mg/l (as Pb) = 48-hour TL<sub>50</sub> for sticklebacks and coho salmon  
1.4 mg/l (as Pb) = 48-hour TL<sub>50</sub> for Bluegill sunfish  
2.0 mg/l (as Pb) = 24-hour TL<sub>50</sub> for Bluegill sunfish
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Animals and fish are capable of concentrating lead.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 455.13
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** 2053.4°F = 1123°C = 1396.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 8.235 at room temperature (Stolzite) 8.46 at room temperature (Raspite)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 15.7 (calculated)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** 33.4 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# LEAD TUNGSTATE

LTU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# METHYL AMYL ALCOHOL

MAA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isobutylmethylcarbinol Isobutyl methylmethanol MAOH Methyl isobutyl carbinol 4-Methyl-2-pentanol MIC	Oily liquid  Colorless  Mild alcohol odor  Floats on water. Irritating vapor is produced.
Notify local health and pollution control agencies. Keep people away. Call fire department. Avoid contact with liquid and vapor.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. Harmful if skin is exposed. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $(CH_3)_2CHCH_2CH(OH)CH_3$   
2.3 IMO/UN Designation: 3.3/2053  
2.4 DOT ID No.: 2053  
2.5 CAS Registry No.: 108-11-2  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air pack or organic canister mask; rubber gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Vapor irritates eyes and nose. May cause anesthesia. Prolonged contact with liquid causes irritation and cracking of skin, and irritates eyes.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give artificial respiration if needed; call a doctor. SKIN: flush with water. EYES: flush with water for at least 15 min.; consult a doctor.  
3.4 **TLV-TWA:** 25 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 40 ppm.  
3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5$  to  $5$  g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 400 ppm  
3.14 **OSHA PEL-TWA:** 25 ppm.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 120-130°F O.C.; 106°F C.C.  
4.2 **Flammable Limits in Air:** 1.0%-5.5%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 583°F (calc.)  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4.7 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 370 ppm/24 hr/brine shrimp/TL<sub>m</sub>  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 50% of theoretical in 5 days, freshwater  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** (C)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 102.18  
9.3 **Boiling Point at 1 atm:** 269.2°F = 131.8°C = 405°K  
9.4 **Freezing Point:** <-130°F = <-90°C = <183°K  
9.5 **Critical Temperature:** 555.8°F = 291°C = 564.2°K  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.807 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 22.8 dynes/cm = 0.0228 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.053  
9.12 **Latent Heat of Vaporization:** 162 Btu/lb = 90.1 cal/g =  $3.77 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -16,640 Btu/lb = -9240 cal/g =  $-387 \times 10^3$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL AMYL ALCOHOL

MAA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	51.690	34	0.501	50	1.040	77	3.800
40	51.480	36	0.502	52	1.040		
45	51.270	38	0.503	54	1.040		
50	51.060	40	0.504	56	1.040		
55	50.850	42	0.505	58	1.040		
60	50.650	44	0.507	60	1.040		
65	50.440	46	0.508	62	1.040		
70	50.230	48	0.509	64	1.040		
75	50.020	50	0.510	66	1.040		
80	49.810	52	0.511	68	1.040		
85	49.610	54	0.512	70	1.040		
90	49.400	56	0.513	72	1.040		
95	49.190	58	0.514	74	1.040		
100	48.980	60	0.515	76	1.040		
105	48.770	62	0.517	78	1.040		
110	48.570	64	0.518	80	1.040		
115	48.360	66	0.519	82	1.040		
120	48.150	68	0.520	84	1.040		
125	47.940	70	0.521				
130	47.730	72	0.522				
135	47.520	74	0.523				
140	47.320	76	0.524				
		78	0.525				
		80	0.527				
		82	0.528				
		84	0.529				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.700	60	0.073	60	0.00133	0	0.347
		70	0.103	70	0.00186	25	0.362
		80	0.145	80	0.00255	50	0.377
		90	0.200	90	0.00347	75	0.391
		100	0.274	100	0.00467	100	0.405
		110	0.371	110	0.00620	125	0.420
		120	0.497	120	0.00816	150	0.433
		130	0.659	130	0.01063	175	0.447
		140	0.864	140	0.01372	200	0.460
		150	1.124	150	0.01756	225	0.473
		160	1.450	160	0.02227	250	0.486
		170	1.854	170	0.02803	275	0.499
		180	2.353	180	0.03502	300	0.511
		190	2.964	190	0.04343	325	0.523
		200	3.707	200	0.05349	350	0.535
		210	4.605	210	0.06545	375	0.547
		220	5.682	220	0.07958	400	0.558
		230	6.969	230	0.09619	425	0.569
		240	8.497	240	0.11560	450	0.580
		250	10.300	250	0.13820	475	0.591
		260	12.420	260	0.16430	500	0.602
		270	14.900	270	0.19440	525	0.612
		280	17.780	280	0.22880	550	0.622
		290	21.120	290	0.26820	575	0.632
		300	24.970	300	0.31290	600	0.642

# METHYL AMYL ACETATE

MAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hexyl acetate MAAC Methyl isobutyl carbinyl acetate 4-Methyl-2-pentanol acetate 4-Methyl-2-pentyl acetate	Watery liquid  Colorless  Pleasant fruity odor  Floats on water.
<b>Keep people away. Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	COMBUSTIBLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula:  $\text{CH}_3\text{COOCH}(\text{CH}_3)\text{CH}_2\text{CH}(\text{CH}_3)_2$   
2.3 IMO/UN Designation: 3.3/1233  
2.4 DOT ID No.: 1233  
2.5 CAS Registry No.: 108-84-9  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Organic canister or air pack; rubber gloves; goggles.  
3.2 **Symptoms Following Exposure:** Headache, dizziness, nausea, irritation to respiratory passages. Irritates eyes.  
3.3 **Treatment of Exposure:** INHALATION: remove from exposure immediately; call a physician; if breathing is irregular or has stopped, start resuscitation and administer oxygen. EYE CONTACT: flush with water for at least 15 min.  
3.4 **TLV-TWA:** 50 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1;  $\text{LD}_{50}$  = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation, such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 500 ppm  
3.14 **OSHA PEL-TWA:** 50 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 110°F O.C. 113°F C.C.  
4.2 **Flammable Limits in Air:** 0.9%-5.7% (calc.)  
4.3 **Fire Extinguishing Agents:** Alcohol foam, carbon dioxide, or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 510°F (calc.)  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** 230 ppm/24 hr/brine shrimp/TL<sub>m</sub>  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 20% of theoretical in 5 days/freshwater  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 95-99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** (C)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 144.22  
9.3 **Boiling Point at 1 atm:** 295.2°F = 146.2°C = 419.4°K  
9.4 **Freezing Point:** -82.8°F = -63.8°C = 209.4°K  
9.5 **Critical Temperature:** 606.2°F = 319°C = 592.2°K  
9.6 **Critical Pressure:** 382 psia = 26 atm = 2.6 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.860 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 25°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 25°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.046  
9.12 **Latent Heat of Vaporization:** 225 Btu/lb = 125 cal/g = 5.23 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -14,400 Btu/lb = -8,000 cal/g = -335 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.21 psia

### NOTES

# METHYL AMYL ACETATE

MAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	54.770	35	0.472	42	1.040	42	2.837
40	54.600	40	0.474	44	1.040	44	2.753
45	54.440	45	0.477	46	1.040	46	2.673
50	54.270	50	0.480	48	1.040	48	2.595
55	54.100	55	0.483	50	1.040	50	2.520
60	53.940	60	0.485	52	1.040	52	2.448
65	53.770	65	0.488	54	1.040	54	2.379
70	53.600	70	0.491	56	1.040	56	2.312
75	53.440	75	0.494	58	1.040	58	2.247
80	53.270	80	0.497	60	1.040	60	2.185
85	53.100	85	0.499	62	1.040	62	2.125
90	52.940	90	0.502	64	1.040	64	2.067
95	52.770	95	0.505	66	1.040	66	2.011
100	52.610	100	0.508	68	1.040	68	1.957
105	52.440			70	1.040	70	1.905
110	52.270			72	1.040	72	1.854
115	52.110			74	1.040	74	1.806
120	51.940			76	1.040	76	1.758
125	51.770			78	1.040	78	1.713
130	51.610			80	1.040	80	1.669
135	51.440			82	1.040	82	1.626
140	51.270			84	1.040	84	1.585

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.100	60	0.051	60	0.00131	0	0.277
		70	0.074	70	0.00187	25	0.291
		80	0.105	80	0.00262	50	0.304
		90	0.148	90	0.00361	75	0.317
		100	0.205	100	0.00491	100	0.329
		110	0.279	110	0.00658	125	0.342
		120	0.375	120	0.00870	150	0.354
		130	0.498	130	0.01135	175	0.366
		140	0.654	140	0.01465	200	0.378
		150	0.848	150	0.01870	225	0.390
		160	1.089	160	0.02362	250	0.401
		170	1.385	170	0.02955	275	0.412
		180	1.744	180	0.03664	300	0.423
		190	2.178	190	0.04504	325	0.434
		200	2.697	200	0.05492	350	0.444
		210	3.313	210	0.06647	375	0.455
		220	4.040	220	0.07987	400	0.465
		230	4.893	230	0.09531	425	0.475
						450	0.485
						475	0.494
						500	0.503
						525	0.513
						550	0.521
						575	0.530
						600	0.539

# METHACRYLIC ACID

MAD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Methylacrylic acid alpha-Methylacrylic acid 2-Methylpropenic acid Propenionic acid, 2-Methylene	Liquid  Colorless  Sharp, acid, repulsive odor  Soluble in water. Freezing point is 61°F.
<b>Keep people away. Avoid contact with liquid and vapors. Wear goggles, self-contained breathing apparatus, rubber clothing and gloves. Call fire department. Stay upwind and use water to knock down vapor. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible Poisonous gases may be produced in fire or when heated. Containers may explode if heated. Vapor may explode if ignited in an enclosed area. Extinguish with water, dry chemical, alcohol foam or carbon dioxide. Wear goggles, self-contained breathing apparatus, and rubber overclothing. Combat fires from safe distance or protected location. Use water to cool fire-exposed containers.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to skin, eyes and respiratory tract. Move to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Severe irritant. Corrosive. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 4; Organic acid  
2.2 Formula:  $\text{CH}_2=\text{C}(\text{CH}_3)\text{COOH}$   
2.3 IMO/UN Designation: 8/2531  
2.4 DOT ID No.: 2531  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 153P  
2.7 Standard Industrial Trade Classification: 51373

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear chemical respirator, goggles, rubber overclothing, and gloves.
- 3.2 **Symptoms Following Exposure:** INHALATION: Severe irritation to respiratory tract. EYES: Short contact can cause severe damage. SKIN: Causes severe irritation and burns. Ingestion: High hazard - may cause death or permanent injury on short exposure to small quantities. OTHER: May affect blood pressure temporarily.
- 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air. If symptoms are apparent, consult physician promptly. EYES: Flush eyes with large quantities of water for 15 min. and consult physician promptly. SKIN: Flush immediately with plenty of water while removing contaminated clothing. For burns, get medical attention. INGESTION: Give milk or water to drink, if victim is conscious. DO NOT INDUCE VOMITING. Consult a physician.
- 3.4 TLV-TWA: 20 ppm.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4;  $\text{LD}_{50}$  below 50 mg/kg (rats)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Prolonged exposure may damage lungs and kidneys.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second degree burns after a few minutes contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 170°F O.C. 152°F C.C.
- 4.2 **Flammable Limits in Air:** 2.4% L.F.L.(calculated)
- 4.3 **Fire Extinguishing Agents:** Alcohol foam, carbon dioxide, dry chemical, water spray.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Vapor forms explosive mixtures with air. Thermal decomposition produces carbon monoxide and carbon dioxide.
- 4.6 **Behavior in Fire:** Vapors form explosive mixtures with air. Sealed containers may rupture explosively at elevated temperatures (polymerization).
- 4.7 **Auto Ignition Temperature:** 752°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable if stored away from heat.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Sodium carbonate, dilute caustic solutions.
- 5.5 **Polymerization:** Heat, strong oxidizers, alkalies, or hydrogen chloride may cause rapid polymerization and release high energy rapidly; may cause explosion under confinement.
- 5.6 **Inhibitor of Polymerization:** 0.025% p-methoxyphenol; 1,000 ppm hydroquinone + 250 ppm hydroquinone monomethyl ether.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 0.89% in 5 days.
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (1)  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99% plus; 40% aqueous solution; crude monomer (85%); glacial (98% plus).
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 2              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 86.09
- 9.3 **Boiling Point at 1 atm:** 320-325°F = 160-163°C = 433-436°K
- 9.4 **Freezing Point:** 61°F = 16°C = 289°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.015 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 2.97
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHACRYLIC ACID

MAD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	63.310		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# METHYL ACETOACETATE

MAE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetoacetic acid, methyl ester Butanoic acid, 3-oxo-methyl ester (9c) Methyl acetylacetonate Methyl-3-oxo-butyrate 3-Oxobutanoic acid methyl ester		Liquid	Colorless
Keep people away. Shut off ignition sources and call fire department. Notify local health and pollution agencies.			
<b>Fire</b>	Combustible. Wear self-contained breathing apparatus and protective clothing. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Use water sprays to cool fire exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 34; Esters 2.2 Formula: CH <sub>3</sub> COCH <sub>2</sub> CO <sub>2</sub> CH <sub>3</sub> 2.3 IMO/UN Designation: Currently not available 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 105-45-3 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51372
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Respirator, chemical safety goggles, rubber boots and heavy rubber gloves. 3.2 <b>Symptoms Following Exposure:</b> May be harmful by inhalation, ingestion, or skin absorption. Causes eye irritation. May cause skin irritation. 3.3 <b>Treatment of Exposure:</b> INHALATION: Call for medical aid. Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush eyes with copious amounts of water for at least 15 minutes. SKIN: Wash with soap and copious amounts of water. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 3.228 g/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations. 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 3.12 <b>Odor Threshold:</b> Currently not available. 3.13 <b>IDLH Value:</b> Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 158°F C.C.  
4.2 **Flammable Limits in Air:** LEL 3.1% - UEL 16%  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 536°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Data not available.  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.  
8.2 49 CFR Class: Not listed.  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 116.12  
9.3 **Boiling Point at 1 atm:** 336-338°F = 169-170°C = 442.2-443.2°K  
9.4 **Freezing Point:** -112°F = -80°C = 193.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.076  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.0  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# METHYL ACETOACETATE

MAE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	53.800	68	0.033		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.258 0.267 0.276 0.285 0.294 0.303 0.311 0.319 0.328 0.336 0.344 0.352 0.359 0.367 0.374 0.381 0.388 0.395 0.402 0.409 0.415 0.422 0.428 0.434 0.440

# METHYL ALCOHOL

MAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Colonial spirit Columbian spirit Methanol Pyroxylic spirit Wood alcohol Wood spirit	Watery liquid  Colorless  Alcohol odor  Floats and mixes with water. Flammable, irritating vapor is produced.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	FLAMMABLE. Vapor may explode if ignited in an enclosed area. Flashback along vapor trail may occur. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol
- 2.2 Formula: CH<sub>3</sub>OH
- 2.3 IMO/UN Designation: 3.2/1230
- 2.4 DOT ID No.: 1230
- 2.5 CAS Registry No.: 67-56-1
- 2.6 NAERG Guide No.: 131
- 2.7 Standard Industrial Trade Classification: 51211

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved canister mask for high vapor concentrations; safety goggles; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Exposure to excessive vapor causes eye irritation, head-ache, fatigue and drowsiness. High concentrations can produce central nervous system depression and optic nerve damage. 50,000 ppm will probably cause death in 1 to 2 hrs. Can be absorbed through skin. Swallowing may cause death or eye damage.
- 3.3 **Treatment of Exposure:** Remove victim from exposure and apply artificial respiration if breathing has ceased. INGESTION: induce vomiting, then give 2 teaspoons of baking soda in glass of water; call a physician. SKIN OR EYES: flush with water for 15 min.
- 3.4 TLV-TWA: 200 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: 250 ppm
- 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 100 ppm
- 3.13 **IDLH Value:** 6,000 ppm
- 3.14 **OSHA PEL-TWA:** 200 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 61°F O.C. 54°F C.C.
- 4.2 **Flammable Limits in Air:** 6.0%-36.5%
- 4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode.
- 4.7 **Auto Ignition Temperature:** 867°F
- 4.8 **Electrical Hazards:** Class I, Group D
- 4.9 **Burning Rate:** 1.7 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 7.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 3.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 9.7-10.0%; CO<sub>2</sub> diluent: 12.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 250 ppm/11 hr/goldfish/died/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 0.6 to 1.12 lb/lb in 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** CP, Crude, ACS: all 99.9%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester) or pressure-vacuum
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** U154
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 32.04
- 9.3 **Boiling Point at 1 atm:** 148.1°F = 64.5°C = 337.7°K
- 9.4 **Freezing Point:** -144.0°F = -97.8°C = 175.4°K
- 9.5 **Critical Temperature:** 464.0°F = 240°C = 513.2°K
- 9.6 **Critical Pressure:** 1142.0 psia = 77.7 atm = 7.87 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.792 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 1.1
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.254
- 9.12 **Latent Heat of Vaporization:** 473.0 Btu/lb = 262.8 cal/g = 11.00 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -8419 Btu/lb = -4677 cal/g = -195.8 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 23.70 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 4.5 psia

### NOTES

# METHYL ALCOHOL

MAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
15	51.110	60	0.576	65	1.389		N O T  P E R T I N E N T
20	50.950	70	0.593	70	1.384		
25	50.790	80	0.611	75	1.379		
30	50.630	90	0.629	80	1.374		
35	50.470	100	0.647	85	1.369		
40	50.310	110	0.665	90	1.364		
45	50.150	120	0.682	95	1.360		
50	49.990	130	0.700	100	1.355		
55	49.830	140	0.718	105	1.350		
60	49.670			110	1.345		
65	49.510			115	1.340		
70	49.350			120	1.335		
75	49.190			125	1.330		
80	49.030			130	1.325		
85	48.870						
90	48.710						
95	48.550						
100	48.390						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	20	0.377	20	0.00235	0	0.280
		30	0.537	30	0.00327	25	0.289
		40	0.753	40	0.00450	50	0.299
		50	1.044	50	0.00611	75	0.309
		60	1.428	60	0.00820	100	0.319
		70	1.930	70	0.01087	125	0.328
		80	2.579	80	0.01427	150	0.338
		90	3.412	90	0.01852	175	0.348
		100	4.467	100	0.02383	200	0.359
		110	5.795	110	0.03036	225	0.369
		120	7.450	120	0.03836	250	0.379
		130	9.496	130	0.04807	275	0.390
		140	12.010	140	0.05976	300	0.400
		150	15.070	150	0.07376	325	0.411
		160	18.770	160	0.09039	350	0.422
		170	23.210	170	0.11000	375	0.432
						400	0.443
						425	0.454
						450	0.466
						475	0.477
						500	0.488
						525	0.500
						550	0.511
						575	0.523
						600	0.534

# METHYL ACRYLATE

MAM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acrylic acid, methyl ester Methyl 2-propenoate	Watery liquid  Colorless  Sweet sharp odor  Floats and mixes slowly with water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Wear chemical protective suit with self-contained breathing apparatus. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Containers may explode when heated. Vapor may explode if ignited in an enclosed area. Wear chemical protective suit with self-contained breathing apparatus. Combat fires from safe distance or protected location. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 14; Acrylate  
2.2 Formula:  $\text{CH}_2=\text{CHCOOCH}_3$   
2.3 IMO/UN Designation: 3.2/1919  
2.4 DOT ID No.: 1919  
2.5 CAS Registry No.: 96-33-3  
2.6 NAERG Guide No.: 129P  
2.7 Standard Industrial Trade Classification: 51379

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister for high vapor concentrations; rubber gloves; chemical goggles or face shield.
- 3.2 **Symptoms Following Exposure:** May irritate skin, eyes, respiratory system, and gastro-intestinal tract. Fumes cause tears.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; lay patient down; keep him warm; administer artificial respiration if breathing has stopped; administer oxygen. SKIN OR EYES: flush with plenty of water for 15 min.; consult physician for eye exposure.
- 3.4 **TLV-TWA:** 2 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50} = 50$  to 500 mg/kg (rabbit)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 250 ppm
- 3.14 **OSHA PEL-TWA:** 10 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 44°F O.C. 27°F C.C.
- 4.2 **Flammable Limits in Air:** 2.8%-25%
- 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors are generated in fires.
- 4.6 **Behavior in Fire:** May polymerize. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Heat may cause an exothermic polymerization. Strong ultraviolet light can also initiate polymerization.
- 5.6 **Inhibitor of Polymerization:** Hydroquinone and its methyl ether, in presence of air.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.9%
- 7.2 **Storage Temperature:** Ambient if material is inhibited; under 40°F if no inhibitor.
- 7.3 **Inert Atmosphere:** Air MUST be present.
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 2              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 86.09
- 9.3 **Boiling Point at 1 atm:** 177°F = 80.6°C = 353.8°K
- 9.4 **Freezing Point:** -105.7°F = -76.5°C = 196.7°K
- 9.5 **Critical Temperature:** 505.4°F = 263°C = 536.2°K
- 9.6 **Critical Pressure:** 630 psia = 43 atm = 4.3 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.956 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 24.2 dynes/cm = 0.0242 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** 3.0
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.102
- 9.12 **Latent Heat of Vaporization:** 160 Btu/lb = 90 cal/g = 3.8 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** (est.) -9900 Btu/lb = -5500 cal/g = -230 X 10<sup>6</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** -392 Btu/lb = -218 cal/g = -9.13 X 10<sup>5</sup> J/kg
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 3.1 psia

### NOTES

# METHYL ACRYLATE

MAM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	61.090	0	0.427	0	1.258	20	0.708
36	61.010	10	0.430	10	1.238	30	0.651
38	60.920	20	0.433	20	1.217	40	0.601
40	60.840	30	0.436	30	1.197	50	0.557
42	60.760	40	0.439	40	1.177	60	0.517
44	60.670	50	0.443	50	1.157	70	0.482
46	60.590	60	0.446	60	1.137	80	0.450
48	60.510	70	0.449	70	1.117	90	0.421
50	60.430	80	0.452	80	1.097	100	0.395
52	60.340	90	0.455	90	1.076	110	0.372
54	60.260	100	0.458	100	1.056	120	0.350
56	60.180	110	0.462	110	1.036	130	0.331
58	60.090	120	0.465	120	1.016	140	0.313
60	60.010	130	0.468	130	0.996	150	0.297
62	59.930	140	0.471	140	0.976	160	0.282
64	59.840	150	0.474	150	0.955	170	0.268
66	59.760	160	0.477	160	0.935		
68	59.680	170	0.481	170	0.915		
70	59.590						
72	59.510						
74	59.430						
76	59.340						
78	59.260						
80	59.180						
82	59.090						
84	59.010						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	5.500	40	0.547	40	0.00879	0	0.224
		50	0.751	50	0.01182	25	0.233
		60	1.015	60	0.01567	50	0.242
		70	1.353	70	0.02049	75	0.251
		80	1.779	80	0.02644	100	0.259
		90	2.311	90	0.03372	125	0.268
		100	2.967	100	0.04252	150	0.276
		110	3.769	110	0.05305	175	0.285
		120	4.738	120	0.06556	200	0.293
		130	5.902	130	0.08027	225	0.301
		140	7.285	140	0.09743	250	0.310
		150	8.919	150	0.11730	275	0.318
		160	10.830	160	0.14020	300	0.326
		170	13.060	170	0.16630	325	0.333
		180	15.630	180	0.19600	350	0.341
		190	18.590	190	0.22950	375	0.349
		200	21.970	200	0.26710	400	0.356
		210	25.810	210	0.30910	425	0.364
		220	30.150	220	0.35580	450	0.371
		230	35.040	230	0.40750	475	0.379
		240	40.510	240	0.46440	500	0.386
						525	0.393
						550	0.400
						575	0.407
						600	0.414

# N-METHYLANILINE

MAN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Anilinomethane N-Methylaminobenzene Methylaniline (mono) Methylphenylamine	Liquid  Yellow to light brown  Chemical odor  May float or sink in water.
Keep people away. Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Chemical and Physical Treatment: Absorb Clean shore line	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $C_6H_5NHCH_3$ 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 2294 2.5 CAS Registry No.: 100-61-8 2.6 NAERG Guide No.: 153 2.7 Standard Industrial Trade Classification: 51454
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Approved respirator; rubber gloves; splash proof goggles 3.2 <b>Symptoms Following Exposure:</b> Inhalation causes dizziness and headache. Ingestion causes bluish discoloration (cyanosis) of lips, ear lobes, and fingernail beds. Liquid irritates eyes. Absorption through skin produces same symptoms as for ingestion. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove victim to fresh air and call a physician at once; administer oxygen until physician arrives. INGESTION: give large amount of water; get medical attention at once. EYES or SKIN: flush with plenty of water for at least 15 min.; if cyanosis is present, shower with soap and warm water, with special attention to scalp and finger nails; remove any contaminated clothing. 3.4 TLV-TWA: 0.5 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Currently not available 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: 100 ppm 3.14 OSHA PEL-TWA: 2 ppm 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 175°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Toxic vapors are generated when heated.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: 3.65 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 48.8 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 12.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: May attack some forms of plastics  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: -  
Damage to living resources: -BC2  
Human Oral hazard: I  
Human Contact hazard: X  
Reduction of amenities:

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical; Pure, 99+%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 107.2  
9.3 Boiling Point at 1 atm: 384.6°F = 195.9°C = 469.1°K  
9.4 Freezing Point: -71°F = -57°C = 216°K  
9.5 Critical Temperature: 802.4°F = 428°C = 701.2°K  
9.6 Critical Pressure: 754 psia = 51.3 atm = 5.20 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.989 at 20°C (liquid)  
9.8 Liquid Surface Tension: 39.6 dynes/cm = 0.0396 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 3.70  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: 180 Btu/lb = 100 cal/g = 4.20 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -16,350 Btu/lb = -9,085 cal/g = -380.1 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# N-METHYLANILINE

MAN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	62.680	34	0.510	51	1.282	55	2.833
36	62.620	36	0.510	52	1.282	60	2.633
38	62.570	38	0.510	53	1.282	65	2.450
40	62.510	40	0.510	54	1.282	70	2.283
42	62.460	42	0.510	55	1.282	75	2.131
44	62.400	44	0.510	56	1.282	80	1.991
46	62.350	46	0.510	57	1.282	85	1.862
48	62.290	48	0.510	58	1.282	90	1.744
50	62.230	50	0.510	59	1.282	95	1.636
52	62.180	52	0.510	60	1.282	100	1.535
54	62.120	54	0.510	61	1.282	105	1.443
56	62.070	56	0.510	62	1.282	110	1.358
58	62.010	58	0.510	63	1.282	115	1.279
60	61.960	60	0.510	64	1.282	120	1.206
62	61.900	62	0.510	65	1.282		
64	61.850	64	0.510	66	1.282		
66	61.790	66	0.510	67	1.282		
68	61.740	68	0.510	68	1.282		
70	61.680	70	0.510	69	1.282		
72	61.620	72	0.510	70	1.282		
74	61.570	74	0.510	71	1.282		
76	61.510	76	0.510	72	1.282		
78	61.460	78	0.510	73	1.282		
80	61.400	80	0.510	74	1.282		
82	61.350	82	0.510	75	1.282		
84	61.290	84	0.510	76	1.282		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	120	0.041	120	0.00070		N
	N	130	0.058	130	0.00098		O
	S	140	0.081	140	0.00135		T
	O	150	0.111	150	0.00182		P
	L	160	0.151	160	0.00244		E
	U	170	0.203	170	0.00322		R
	B	180	0.269	180	0.00420		T
	L	190	0.353	190	0.00543		I
	E	200	0.458	200	0.00693		N
		210	0.589	210	0.00878		E
		220	0.749	220	0.01101		N
		230	0.945	230	0.01368		T
		240	1.182	240	0.01687		
		250	1.467	250	0.02065		
		260	1.807	260	0.02508		
		270	2.210	270	0.03025		
		280	2.685	280	0.03625		
		290	3.241	290	0.04318		
		300	3.888	300	0.05111		
		310	4.637	310	0.06017		
		320	5.500	320	0.07045		
		330	6.489	330	0.08206		
		340	7.617	340	0.09512		
		350	8.898	350	0.10970		
		360	10.350	360	0.12610		
		370	11.980	370	0.14420		



# METHYL ACETYLENE, PROPADIENE MIXTURE

MAP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Allene-methylacetylene mixture MAPP gas Methylacetylene-allene mixture Propadiene-methylacetylene mixture	Gas	Colorless	Garlic-like odor
Floats and boils on water. Flammable visible vapor cloud is produced.			
Keep people away. Avoid contact with liquid. Shut off ignition sources. Call fire department. Evacuate area in case of large discharge. Notify local health and pollution control agencies.			
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Let fire burn. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water.		
<b>Exposure</b>	Call for medical aid.  VAPOR If inhaled will cause difficult breathing. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.		
<b>Water Pollution</b>	Not harmful to aquatic life.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 30; Olefin
- 2.2 Formula:  $\text{CH}_3\text{C}\equiv\text{CH} + \text{CH}_2=\text{C}=\text{CH}_2$
- 2.3 IMO/UN Designation: 2/1060
- 2.4 DOT ID No.: 1060
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 116P
- 2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus for high concentrations; safety goggles; protective gloves.
- 3.2 **Symptoms Following Exposure:** Simple asphyxiant. Toxicology of propadiene component not fully established. Contact with liquid may burn eyes and cause frostbite of skin.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give artificial respiration if necessary. EYES or SKIN: treat burns caused by cold liquid.
- 3.4 **TLV-TWA:** 1,000 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 1,250 ppm
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Lung irritation in rats and dogs
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** 100 ppm
- 3.13 **IDLH Value:** 3,400 ppm
- 3.14 **OSHA PEL-TWA:** 1,000
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (flammable, liquefied compressed gas)
- 4.2 **Flammable Limits in Air:** 3%-11%
- 4.3 **Fire Extinguishing Agents:** Let fire burn; shut off gas supply; cool adjacent exposures.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode.
- 4.7 **Auto Ignition Temperature:** 850°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction, except forms explosive compounds in contact with alloys containing more than 67% copper at high pressures.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 65% of a mixture of methylacetylene (85%) and propadiene (15%) plus 35% of a mixture of  $\text{C}_3$  and  $\text{C}_4$  saturated and unsaturated hydrocarbons.
- 7.2 **Storage Temperature:** Ambient, but <125°F
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2.1
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 40.1
- 9.3 **Boiling Point at 1 atm:** -36 to -4°F = -38 to -20°C = 235 to 253°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.576 at 15°C (liquid)
- 9.8 **Liquid Surface Tension:** 18 dynes/cm = 0.018 N/m at -24°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 1.48
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1686
- 9.12 **Latent Heat of Vaporization:** 227 Btu/lb = 126 cal/g =  $5.28 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** -19,800 Btu/lb = -11,000 cal/g =  $-460 \times 10^5$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 165 psia

### NOTES

# METHYL ACETYLENE, PROPADIENE MIXTURE

MAP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-35	41.170	0	0.322	16	0.806		N O T  P E R T I N E N T
-30	40.890	5	0.325	18	0.806		
-25	40.620	10	0.328	20	0.806		
-20	40.340	15	0.331	22	0.806		
-15	40.060	20	0.333	24	0.806		
-10	39.780	25	0.336	26	0.806		
-5	39.510	30	0.339	28	0.806		
0	39.230	35	0.342	30	0.806		
5	38.950	40	0.344	32	0.806		
10	38.670	45	0.347	34	0.806		
15	38.400	50	0.350	36	0.806		
20	38.120	55	0.353	38	0.806		
25	37.840	60	0.356	40	0.806		
30	37.560	65	0.358	42	0.806		
35	37.290			44	0.806		
40	37.010			46	0.806		
45	36.730			48	0.806		
50	36.450			50	0.806		
55	36.180						
60	35.900						
65	35.620						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L I T Y		-20	23.250	-20	0.19750	0	0.318
		-15	25.750	-15	0.21630	25	0.327
		-10	28.450	-10	0.23640	50	0.337
		-5	31.370	-5	0.25770	75	0.346
		0	34.510	0	0.28050	100	0.355
		5	37.900	5	0.30460	125	0.364
		10	41.520	10	0.33030	150	0.374
		15	45.410	15	0.35740	175	0.383
		20	49.570	20	0.38610	200	0.392
		25	54.020	25	0.41630	225	0.401
		30	58.760	30	0.44820	250	0.411
		35	63.800	35	0.48180	275	0.420
		40	69.169	40	0.51710	300	0.429
		45	74.870	45	0.55420	325	0.438
		50	80.910	50	0.59300	350	0.448
		55	87.299	55	0.63370	375	0.457
		60	94.059	60	0.67620	400	0.466
		65	101.200	65	0.72060	425	0.475
						450	0.485
						475	0.494
						500	0.503
						525	0.512
						550	0.522
						575	0.531
						600	0.540

# MERCURIC ACETATE

MAT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Solid  White  Mild vinegar-like odor  Sinks and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST. Wear goggles and dust respirator. Stay upwind. Use water sprat to "knock down" dust. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: (CH <sub>3</sub> COO) <sub>2</sub> Hg 2.3 IMO/UN Designation: 6.1/1629 2.4 DOT ID No.: 1629 2.5 CAS Registry No.: 1600-27-7 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 51371
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Rubber gloves, dust mask, goggles 3.2 <b>Symptoms Following Exposure:</b> The general symptoms are those of mercury poisoning, developing rapidly after ingestion but more slowly after low repeated exposures. Contact with eyes causes irritation and ulceration. Skin contact may cause dermatitis. Ingestion causes pain, vomiting, ulceration of mouth and stomach, kidney failure, metallic taste, pallor, and rapid, weak pulse. 3.3 <b>Treatment of Exposure:</b> Have physician treat for mercury poisoning. EYES and SKIN: flush with water. INGESTION: call physician; poison should be removed from stomach as soon as possible; give milk or white of eggs beaten with water, then tablespoon of salt in a glass of warm water and repeat until vomit fluid is clear; repeat milk or white of eggs beaten with water. 3.4 TLV-TWA: 0.025 mg/m <sup>3</sup> (as mercury) 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 3; oral LD <sub>50</sub> = 76 mg/kg (rat) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Intestinal bleeding and kidney damage may develop. 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: 0.1 mg/m <sup>3</sup> 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Smoke may contain toxic mercury or mercury oxide fumes.  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: >0.05"/young salmon/lethal/fresh water  
1.7/48 h4/stickleback/TL<sub>50</sub>/fresh water  
\*Time interval not specified.  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Fish can accumulate mercury and transfer it to higher levels in the food chain  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: C.P.: 99+%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 318.7  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 3.27 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# MERCURIC ACETATE

MAT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
50	25.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# A-METHYLBENZYL ALCOHOL

MBA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> alpha-Methyl benzene methanol Methylphenyl methanol 1-Phenylethanol a-Phenyl ethyl alcohol Phenylmethyl carbinol Styryllyl alcohol	Solid or liquid      Colorless  Sinks and mixes with water.
Avoid contact with solid, liquid, or vapors. Keep people away. Wear self-contained breathing apparatus and full protective clothing. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible Wear self-contained breathing apparatus and full protective clothing. Extinguish with CO <sub>2</sub> , dry chemical, foam, or water spray.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR Harmful if inhaled or absorbed through the skin. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID Harmful if swallowed or absorbed through the skin. IF IN EYES: flush with water for at least 15 minutes. Remove contaminated clothing and shoes. Flush affected areas with water. IF SWALLOWED: do nothing except keep victim warm. DO NOT INDUCE VOMITING
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. May be dangerous if it enters local water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: C<sub>6</sub>H<sub>5</sub>CH(OH)CH<sub>3</sub>
- 2.3 IMO/UN Designation: 6.1/2937
- 2.4 DOT ID No.: 2937
- 2.5 CAS Registry No.: 98-85-1
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51235

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, chemical safety goggles, chemical resistant gloves, other protective clothing.
- 3.2 **Symptoms Following Exposure:** Irritating to the skin, eyes, nose, throat, and upper respiratory tract.
- 3.3 **Treatment of Exposure:** EYES: Flush with water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes, flush affected areas with water. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Do nothing except keep victim warm. DO NOT INDUCE VOMITING.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 400 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 205°F O.C. 200°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** CO<sub>2</sub>, dry chemical, foam, or water spray.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 122.17
- 9.3 **Boiling Point at 1 atm:** 397°F = 203°C = 476°K
- 9.4 **Freezing Point:** 68°F = 20°C = 293°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.015 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 4.21
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Very low

### NOTES

# A-METHYLBENZYL ALCOHOL

MBA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	63.230		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	120 140 160 180 200 220 240 260 280 300 320 340 360 380	0.017 0.040 0.084 0.161 0.289 0.490 0.794 1.237 1.864 2.732 3.906 5.465 7.501 10.120		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.253 0.266 0.280 0.292 0.305 0.317 0.329 0.341 0.353 0.364 0.375 0.386 0.397 0.408 0.418 0.428 0.438 0.447 0.457 0.466 0.475 0.484 0.493 0.501 0.509

# METHYL TERT-BUTYL ETHER

MBE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> tert-Butyl methyl ether 2-Methoxy-2-methyl propane 2-Methyl-2-methoxy propane	Liquid  Colorless  Floats and mixes slowly with water.
Keep people away. Avoid contact with liquid and vapor. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapors. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber over-clothing, including gloves and boots. Extinguish with water spray, dry chemical, foam or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR A mild irritant to eyes and skin. If inhaled, may cause dizziness and/or suffocation. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID May irritate or burn skin and eyes. May be harmful if swallowed. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 41; Ether  
2.2 Formula:  $(CH_3)_3COCH_2(CH_3)_3COCH_3$   
2.3 IMO/UN Designation: 3/2398  
2.4 DOT ID No.: 2398  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear goggles, self-contained breathing apparatus, rubber gloves, boots and overclothing.
- 3.2 **Symptoms Following Exposure:** INHALATION: May cause dizziness or suffocation. Contact may irritate or burn eyes or skin. May be harmful if swallowed.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 minutes; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. INGESTION: If victim is unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 **TLV-TWA:** 40 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2:  $LD_{50} = 2.96$  g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes skin and respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -14°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, alcohol foam or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** May contain irritating and toxic gases.
- 4.6 **Behavior in Fire:** May be ignited by heat, sparks or flames. Containers may explode in heat of fire. Vapor explosion hazard indoors, outdoors, or in sewers.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 71.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 22.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** May form explosive peroxides on standing. May react vigorously with oxidizing materials.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 88.15
- 9.3 **Boiling Point at 1 atm:** 131.4°F = 55.2°C = 328.2°K
- 9.4 **Freezing Point:** -164.2°F = -109°C = 164°K
- 9.5 **Critical Temperature:** 435.4°F = 224.1°C = 497.3°K
- 9.6 **Critical Pressure:** 520 psia = 35.4 atm = 3.59 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.7405 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 3.0 (calc.)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** 16,365 Btu/lb = 9,092.4 cal/g = 380.7 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Data not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL TERT-BUTYL ETHER

MBE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	46.220		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	4.800	-50 -25 0 25 50 75 100 125	0.113 0.101 0.071 0.059 0.051 0.045 0.040 0.036		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# METHYL N-BUTYL KETONE

MBK

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Butyl methyl ketone 2-Hexanone	Liquid  Clear  Disagreeable Odor  Floats and mixes with water.
Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water of milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_3\text{COCH}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 591-78-6  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield; approved respirator (for major spills)
- 3.2 **Symptoms Following Exposure:** Inhalation of high concentrations of vapor may result in narcosis; peripheral neuropathy may develop. Ingestion of large amounts may cause some systemic injury. Contact with eyes causes mild to moderate irritation. Liquid irritates skin; prolonged or repeated contact may cause defatting of the skin with resultant dermatitis.
- 3.3 **Treatment of Exposure:** INHALATION: move to uncontaminated atmosphere and treat symptomatically; alert physician to possible development of peripheral neuropathy. INGESTION: give large amount of water and induce vomiting. EYES: irrigate immediately and thoroughly with water for 15 min. and get medical attention. SKIN: flush exposed areas thoroughly with water.
- 3.4 **TLV-TWA:** 5 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 2,590 \text{ mg/kg}$  (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Peripheral neuropathy in experimental animals and man (disease of motor and/or sensory nerves)  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 1,600 ppm.  
3.14 **OSHA PEL-TWA:** 100 ppm.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 83°F O.C. 77°F C.C.  
4.2 **Flammable Limits in Air:** 1.3%-8.0%  
4.3 **Fire Extinguishing Agents:** Dry chemical, "alcohol" foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 795°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 4.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 95%; Pure, 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 100.16  
9.3 **Boiling Point at 1 atm:** 261°F = 127°C = 400°K  
9.4 **Freezing Point:** -70.4°F = -56.9°C = 216.3°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.812 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 25.49 dynes/cm = 0.02549 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 9.73 dynes/cm = 0.00973 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 148 Btu/lb = 82 cal/g =  $3.4 \times 10^5 \text{ J/kg}$   
9.13 **Heat of Combustion:** -16,100 Btu/lb = -8,940 cal/g =  $-374 \times 10^3 \text{ J/kg}$   
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL N-BUTYL KETONE

MBK

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	51.470	35	0.550	30	1.038	52	0.711
45	51.320	40	0.550	40	1.029	54	0.699
50	51.170	45	0.550	50	1.019	56	0.688
55	51.030	50	0.550	60	1.010	58	0.677
60	50.880	55	0.550	70	1.001	60	0.666
65	50.730	60	0.550	80	0.992	62	0.655
70	50.580	65	0.550	90	0.982	64	0.645
75	50.430	70	0.550	100	0.973	66	0.635
80	50.280	75	0.550	110	0.964	68	0.625
85	50.120	80	0.550	120	0.955	70	0.615
90	49.970	85	0.550	130	0.945	72	0.606
95	49.820	90	0.550	140	0.936	74	0.596
100	49.660	95	0.550	150	0.927	76	0.587
105	49.510	100	0.550	160	0.918	78	0.578
110	49.350			170	0.908	80	0.570
115	49.190			180	0.899	82	0.561
120	49.030			190	0.890	84	0.553
125	48.870			200	0.881	86	0.545
130	48.710			210	0.871		
				220	0.862		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.400	60	0.231	60	0.00415		N
		70	0.306	70	0.00540		O
		80	0.402	80	0.00695		T
		90	0.522	90	0.00885		
		100	0.671	100	0.01119		P
		110	0.856	110	0.01401		E
		120	1.082	120	0.01741		R
		130	1.357	130	0.02147		T
		140	1.689	140	0.02628		I
		150	2.088	150	0.03195		N
		160	2.563	160	0.03859		E
		170	3.125	170	0.04631		N
		180	3.788	180	0.05525		T
		190	4.564	190	0.06555		
		200	5.468	200	0.07734		
		210	6.516	210	0.09078		
		220	7.724	220	0.10600		
		230	9.112	230	0.12330		
		240	10.700	240	0.14270		
		250	12.500	250	0.16440		
		260	14.550	260	0.18860		

# METHYL BUTENOL

MBL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Buten-3-ol, 3-methyl 2-Methyl-3-buten-2-ol 3-Methyl-1-buten-3-ol 3-Methyl-buten-(1)-ol(3)		Liquid  Colorless  Slightly soluble in water.
Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.		
<b>Fire</b>	FLAMMABLE. Vapor may explode if ignited in an enclosed area. Flashback along vapor trail may occur. Water may be ineffective on fire. Extinguish with alcohol foam, dry chemical or CO <sub>2</sub> .	
<b>Exposure</b>	CALL FOR MEDICAL AID. Harmful if inhaled or swallowed. Material is irritating to mucous membrane and upper respiratory tract.  VAPOR Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 20; Alcohols, glycols <b>2.2 Formula:</b> C <sub>4</sub> H <sub>8</sub> O <b>2.3 IMO/UN Designation:</b> Currently not available <b>2.4 DOT ID No.:</b> Not listed <b>2.5 CAS Registry No.:</b> 115-18-4 <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 51219
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Self-contained breathing apparatus, rubber boots and heavy rubber gloves. <b>3.2 Symptoms Following Exposure:</b> Harmful if inhaled or swallowed. Material is irritating to mucous membrane and upper respiratory tract. <b>3.3 Treatment of Exposure:</b> INHALATION: Call for medical aid. Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with copious amounts of water for at least 15 minutes. SKIN: Wash with soap and copious amounts of water. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Currently not available <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. <b>3.12 Odor Threshold:</b> Currently not available. <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 56°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
**4.5 Special Hazards of Combustion Products:** Vapor may travel considerable distance to a source of ignition and flash back.  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction.  
**5.2 Reactivity with Common Materials:** No reaction.  
**5.3 Stability During Transport:** Currently not available  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent.  
**5.5 Polymerization:** Not pertinent.  
**5.6 Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: (1)  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 98%  
**7.2 Storage Temperature:** Ambient.  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** D  
**7.6 Ship Type:** Data not available  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed.  
**8.2 49 CFR Class:** Not pertinent.  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 86.13  
**9.3 Boiling Point at 1 atm:** 208.4-210.2°F = 98-99°C = 371.2-372.2°K  
**9.4 Freezing Point:** Currently not available  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 0.824  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** 2.97  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# METHYL BUTENOL

MBL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E	77	0.986		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.330 0.344 0.357 0.371 0.384 0.396 0.409 0.421 0.433 0.445 0.456 0.467 0.478 0.489 0.500 0.510 0.520 0.530 0.539 0.549 0.558 0.567 0.576 0.584 0.593

# 3-METHYL-2-BUTANONE

MBO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isopropyl methyl ketone 3-Methyl butan-2-one Methyl isopropyl ketone		Liquid  Colorless  Floats on water.
Keep people away. Avoid contact with vapor or liquid. Shut off sources of ignition. Call fire department. Wear self-contained breathing apparatus and full protective clothing. Notify local health and pollution control agencies.		
<b>Fire</b>	FLAMMABLE Flashback may occur along vapor trail. Emits toxic fumes under fire conditions. Wear self-contained breathing apparatus and full protective clothing. Extinguish with CO <sub>2</sub> , dry chemical, foam, or water spray.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Skin and eye irritant. Harmful if inhaled or absorbed through the skin. Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed or absorbed through the skin. Irritating to the skin and eyes. IF IN EYES: flush with water for at least 15 minutes. Remove contaminated clothing and shoes, flush affected areas with plenty of water IF SWALLOWED: do nothing except keep victim warm. DO NOT INDUCE VOMITING	
<b>Water Pollution</b>	Effect of low concentration on aquatic life is not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: (CH <sub>3</sub> ) <sub>2</sub> CH(CO)CH <sub>3</sub> 2.3 IMO/UN Designation: 3.2/2397 2.4 DOT ID No.: 2397 2.5 CAS Registry No.: 563-80-4 2.6 NAERG Guide No.: 127 2.7 Standard Industrial Trade Classification: 51625
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Approved respirator, chemical resistant gloves, chemical safety goggles, other protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Irritating to the eyes, nose, throat, upper respiratory tract, and skin. 3.3 <b>Treatment of Exposure:</b> Call a physician. EYES: Flush with plenty of water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes, flush affected areas with water. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Do nothing except keep victim warm. DO NOT INDUCE VOMITING. 3.4 TLV-TWA: 200 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 3; LD <sub>50</sub> = 148 mg/kg (rat) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 43°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: CO<sub>2</sub>, dry chemical, foam, or water spray.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Acid smoke and fumes  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 33.3 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 10.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99%  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: None  
7.4 Venting: None  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 86.15  
9.3 Boiling Point at 1 atm: 201°F = 94°C = 367°K  
9.4 Freezing Point: -134°F = -92°C = 181°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 0.8051 at 20°C  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 2.97  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: 161.6 Btu/lb = 89.8 cal/g = 3.8 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -15,334 Btu/lb = -8,519 cal/g = -357 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 1.3 psia

## NOTES

# 3-METHYL-2-BUTANONE

MBO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	50.260	77	0.500		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190	-1.257 -1.955 -0.652 0.650 0.048 0.745 1.443 2.141 2.838 3.536 4.234 4.931 5.629 6.327 7.025 7.722 8.420 9.118 9.815 10.513		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# METHYL BUTYRATE

MBU

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butanoic acid, methyl ester Butyric acid, methyl ester Methyl-n-butanoate Methyl-n-butyrate		Liquid  Colorless   Floats on water.
Keep people away. Avoid contact with vapor or liquid. Wear self-contained breathing apparatus and full protective clothing. Shut off sources of ignition. Call fire department. Notify local health and pollution control agencies.		
<b>Fire</b>	<b>FLAMMABLE</b> Emits toxic fumes under fire conditions. Flashback may occur along vapor trail. Wear self-contained breathing apparatus and full protective clothing. Extinguish with water spray, CO <sub>2</sub> , dry chemical, or foam.	
<b>Exposure</b>	<b>CALL FOR MEDICAL AID</b>  <b>VAPOR</b> Irritating to the eyes, nose, and throat. May be harmful if inhaled or absorbed through the skin. Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to the eyes and skin. May be harmful if swallowed or absorbed through the skin. IF IN EYES: immediately flush with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF SWALLOWED: do nothing except keep victim warm. DO NOT INDUCE VOMITING	
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 34; Esters 2.2 Formula: C <sub>4</sub> H <sub>8</sub> OOCH <sub>3</sub> 2.3 IMO/UN Designation: 3.2/1237 2.4 DOT ID No.: 1237 2.5 CAS Registry No.: 623-42-7 2.6 NAERG Guide No.: 129 2.7 Standard Industrial Trade Classification: 51375
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Approved respirator, chemical safety goggles, chemical-resistant gloves, other protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Irritating to the eyes, nose, throat, upper respiratory tract, and skin. 3.3 <b>Treatment of Exposure:</b> Call a physician. EYES: Immediately flush with water for at least 15 minutes. SKIN: Remove contaminated clothes and shoes, wash affected areas with soap and water. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Do nothing except keep victim warm. DO NOT INDUCE VOMITING. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 3.38 g/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 57°F C.C.  
4.2 **Flammable Limits in Air:** 0.9-3.5%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, CO<sub>2</sub>, dry chemical, water spray.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Dry lime, soda ash  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** None  
7.4 **Venting:** None  
7.5 **IMO Pollution Category:** (C)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 102.13  
9.3 **Boiling Point at 1 atm:** 216°F = 102.3°C = 376°K  
9.4 **Freezing Point:** -121°F = -84.8°C = 188°K  
9.5 **Critical Temperature:** 538.3°F = 281.3°C = 554.5°K  
9.6 **Critical Pressure:** 34.2 atm  
9.7 **Specific Gravity:** 0.8984 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.53  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 143.6 Btu/lb = 79.8 cal/g = 3.3 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -12209 Btu/lb = -6783 cal/g = -284 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 1.2 psia

## NOTES

# METHYL BUTYRATE

MBU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	56.090		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180	0.623 0.600 0.578 0.558 0.539 0.521 0.505 0.489 0.474 0.460 0.446 0.433 0.421 0.409 0.397 0.386 0.376 0.366 0.356 0.346 0.337 0.328 0.319 0.311 0.303

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.700	-10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200	0.038 0.050 0.067 0.088 0.116 0.154 0.203 0.269 0.356 0.470 0.622 0.822 1.087 1.437 1.900 2.513 3.323 4.394 5.809 7.681 10.157 13.429		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.265 0.276 0.286 0.297 0.307 0.317 0.327 0.337 0.346 0.356 0.365 0.374 0.383 0.392 0.401 0.410 0.418 0.427 0.435 0.443 0.451 0.459 0.467 0.474 0.482



# METHYL BUTYNOL

MBY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Hydroxy-2-methyl-3-butyne 2-Methyl-3-butyne-2-ol		Liquid	Colorless to straw yellow
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call the fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Flammable. Wear full chemical protective clothing and self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, or carbon dioxide.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush skin with water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 20; Alcohols, glycols  
2.2 **Formula:** (CH<sub>3</sub>)<sub>2</sub>C(OH)CCH  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** 115-19-5  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear full impervious protective clothing and approved respirator. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Contact will cause eye and skin irritation. Vapor exposure may cause eye and respiratory tract irritation.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 3.6 g/kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available.  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 77°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Irritating and toxic gases, such as carbon dioxide and carbon monoxide, may be produced in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Varying concentrations available.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 84.12  
9.3 **Boiling Point at 1 atm:** 219.2 - 221°F = 104 - 105°C = 377 - 378°K  
9.4 **Freezing Point:** 36.7°F = 2.6°C = 275.6°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.8672  
9.8 **Liquid Surface Tension:** 23.8 dynes/cm @ 25°C.  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL BUTYNOL

MBY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# METHYL BENZOATE

MBZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzoic acid, methyl ester Essence of Niobe Methyl benzenecarboxylate Niobe oil Oil of Niobe Oxide LE	Liquid  Colorless  Pleasant, fragrant odor  Sinks in water.
<b>Keep people away. Avoid contact with liquid and vapor. Wear self-contained breathing apparatus and full protective clothing. Call fire department. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible Fire may produce irritating gases. Wear self-contained breathing apparatus and full protective clothing. Move container from fire area if you can do it without risk. Extinguish with CO <sub>2</sub> , dry chemical, foam, or water spray.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR Irritating to the eyes, nose, and throat. May be harmful if inhaled or absorbed through the skin. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID May be harmful if swallowed or absorbed through the skin. Irritating to skin and eyes. IF IN EYES: immediately flush eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Wash skin with soap and water. IF SWALLOWED: do nothing except keep victim warm. DO NOT INDUCE VOMITING Notify operators of nearby water intakes.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: C<sub>8</sub>H<sub>8</sub>CO<sub>2</sub>CH<sub>3</sub>
- 2.3 IMO/UN Designation: 5.1/2938
- 2.4 DOT ID No.: 2938
- 2.5 CAS Registry No.: 93-58-3
- 2.6 NAERG Guide No.: 152
- 2.7 Standard Industrial Trade Classification: 51379

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, chemical safety goggles, chemical-resistant gloves.
- 3.2 **Symptoms Following Exposure:** Irritating to the eyes, nose, throat, upper respiratory tract, and skin. May cause allergic skin and respiratory reactions.
- 3.3 **Treatment of Exposure:** Call a physician. EYES: Flush with plenty of water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Do nothing except keep victim warm. DO NOT INDUCE VOMITING.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 1.35 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 181°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** CO<sub>2</sub>, dry chemical, foam, or water spray.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** None
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** None
- 5.2 **Reactivity with Common Materials:** None
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Dry lime, soda ash
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 3
  - Human Oral hazard: 1
  - Human Contact hazard: 1
  - Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** None
- 7.4 **Venting:** None
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 136.15
- 9.3 **Boiling Point at 1 atm:** 391°F = 199.6°C = 473°K
- 9.4 **Freezing Point:** 10°F = -12.3°C = 261°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.0888 at 20°C
- 9.8 **Liquid Surface Tension:** 37.6 dynes/cm = 0.038 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 4.7
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** -2,432 Btu/lb = -1,351 cal/g = -56 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.01 psia

## NOTES

# METHYL BENZOATE

MBZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	67.970	77	0.390		C U R R E N T L Y  N O T  A V A I L A B L E	59	2.298

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
86	0.016	120 140 160 180 200 220 240 260 280 300 320 340 360 380	0.038 0.082 0.158 0.284 0.478 0.766 1.179 1.752 2.529 3.558 4.898 6.613 8.776 11.471		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.197 0.208 0.219 0.229 0.240 0.250 0.260 0.270 0.280 0.290 0.299 0.308 0.318 0.326 0.335 0.344 0.352 0.361 0.369 0.377 0.385 0.392 0.400 0.407 0.415

# CHLOROACETIC ACID

MCA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chloroacetic acid Monochloroacetic acid	Solid  Cloudy white solid; liquid is colorless to light yellow  Strong vinegar- like odor  Mixes with water.
Keep people away. Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flood discharge area with water.
<b>Exposure</b>	Call for medical aid.  LIQUID OR SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{ClCH}_2\text{COOH}$   
2.3 IMO/UN Designation: Liquid: 8/1750;  
Solid: 8/1751  
2.4 DOT ID No.: 1751 (solid), 1750 (liquid)  
2.5 CAS Registry No.: 79-11-8  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification:  
51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; vinyl or neoprene rubber gloves; goggles and protective face shield; rubberized or acid-resistant clothing
- 3.2 **Symptoms Following Exposure:** Inhalation causes mucous membrane irritation. Contact with liquid causes severe irritation and burns of the eyes and irritation and burns of skin. Ingestion causes burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention for all exposures to this compound. INHALATION: remove victim to fresh air and enforce rest until medical attention is obtained. EYES: flush with running water for 15 min. SKIN: flush with water; get treatment for burns. INGESTION: give large amount of water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3; oral  $\text{LD}_{50}$  = 76.2 mg/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.  
3.12 Odor Threshold: 0.15 mg/m<sup>3</sup>  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: (almost nonflammable) 259°F C.C.  
4.2 Flammable Limits in Air: 8% (LFL)  
4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, water  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Hydrogen chloride and phosgene may be generated.  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available difficult to ignite  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 7.1 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 4.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Causes mild corrosion of common metals  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with sodium bicarbonate or lime solution  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial: 97.5+%  
7.2 Storage Temperature: Solid: ambient; Liquid: 70°C (158°F)  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: D  
7.6 Ship Type: 2  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 94.5  
9.3 Boiling Point at 1 atm: 372°F = 189°C = 462°K  
9.4 Freezing Point: 140°F = 60°C = 333°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.58 at 20°C (solid)  
9.8 Liquid Surface Tension: 33 dynes/cm = 0.033 N/m at 80°C  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: 250 Btu/lb = 139 cal/g = 5.82 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: (solid) -1,814 Btu/lb = -1,008 cal/g = -42.17 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: -63 Btu/lb = -35 cal/g = -1.5 X 10<sup>5</sup> J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 31.06 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# CHLOROACETIC ACID

MCA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
150	85.480		N O T		N O T		N O T
160	85.059						
170	84.639						
180	84.230						
190	83.809		P		P		P
200	83.400		E		E		E
210	82.980		R		R		R
220	82.559		T		T		T
230	82.150		I		I		I
240	81.730		N		N		N
250	81.320		E		E		E
260	80.900		N		N		N
270	80.480		T		T		T
280	80.070						
290	79.650						
300	79.230						
310	78.820						
320	78.400						
330	77.990						
340	77.570						
350	77.150						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
39	72.000	150	0.081	150	0.00117		N
		160	0.111	160	0.00158		O
		170	0.151	170	0.00210		T
		180	0.202	180	0.00278		
		190	0.269	190	0.00365		P
		200	0.356	200	0.00475		E
		210	0.466	210	0.00612		R
		220	0.605	220	0.00784		T
		230	0.780	230	0.00996		I
		240	0.998	240	0.01256		N
		250	1.269	250	0.01574		E
		260	1.602	260	0.01960		N
		270	2.010	270	0.02424		T
		280	2.505	280	0.02982		
		290	3.105	290	0.03647		
		300	3.827	300	0.04435		
		310	4.692	310	0.05366		
		320	5.721	320	0.06459		
		330	6.941	330	0.07738		
		340	8.381	340	0.09226		
		350	10.070	350	0.10950		
		360	12.050	360	0.12940		
		370	14.360	370	0.15230		

# MERCURIC AMMONIUM CHLORIDE

MCC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Albus Aminomercuric chloride Ammoniated mercury Mercuric chloride, ammoniated Mercury amide chloride Mercury ammonium chloride	Solid  White  Odorless  Sinks in water.
<b>KEEP PEOPLE AWAY.</b> <b>AVOID CONTACT WITH SOLID AND DUST.</b> Wear goggles and dust respirator. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{HgNH}_2\text{Cl}$   
2.3 IMO/UN Designation: 6.1/1630  
2.4 DOT ID No.: 1630  
2.5 CAS Registry No.: 10124-48-8  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Gloves, goggles, respirator  
3.2 **Symptoms Following Exposure:** The general symptoms are those of mercury poisoning, developing rapidly after ingestion but more slowly after low repeated exposures. Contact with eyes causes irritation and ulceration. Skin contact may cause dermatitis. Ingestion causes pain, vomiting, metallic taste, ulceration of mouth and stomach, pallor, and rapid, weak pulse.  
3.3 **Treatment of Exposure:** Have physician treat for mercury poisoning. EYES or SKIN: flush with water. INGESTION: call a physician; give milk or white of egg beaten with water, then a table-spoon of salt in glass of water; repeat until vomit fluid is clear; repeat milk or white of egg.  
3.4 **TLV-TWA:** 0.025 mg/m<sup>3</sup> (as mercury)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Intestinal bleeding and kidney damage may develop.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 0.1 mg/m<sup>3</sup> (as mercury)  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion**  
Products: Smoke may contain toxic mercury compounds.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.12 ppm/8 hr/minnow/lethal/fresh water  
0.023 ppm"/bivalve larvae/lethal/salt water  
\*Time period not specified.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Not pertinent  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 4  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** U.S.P.: 98+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 252.1  
9.3 **Boiling Point at 1 atm:** Not pertinent (sublimes at red heat)  
9.4 **Freezing Point:** Not pertinent (infusible)  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 5.7 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# MERCURIC AMMONIUM CHLORIDE

MCC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.140		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# MERCAPTODIMETHUR

MCD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bay 37344 Mesurol Methiocarb Methmercapturon	Solid	White	Mild
Sinks in water.			
Keep people away. AVOID CONTACT WITH SOLID OR DUST. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Notify local health and pollution control agencies.			
<b>Fire</b>	NOT FLAMMABLE. Dust may be explosive. Poisonous gases are produced in fire. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST. POISONOUS IF INHALED OR SKIN IS EXPOSED. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID. POISONOUS IF SWALLOWED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.		
<b>Water Pollution</b>	HAZARDOUS TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{11}H_{16}NO_2S$   
2.3 IMO/UN Designation: 6.1/2757  
2.4 DOT ID No.: 2757  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety goggles or face mask, hooded suit, approved respirator or self-contained breathing apparatus, rubber gloves and boots.
- 3.2 **Symptoms Following Exposure:** Headache, dizziness, weakness, anxiety, tremors of tongue and eyelids, and impairment of visual acuity. Prolonged contact may result in salivation, tearing, abdominal cramps, vomiting, sweat- ing, and muscular fasculations. Death can occur from respiratory difficulties, cyanosis, and convulsions.
- 3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from exposure. Give oxygen and artificial respiration as needed. EYES: Irrigate with water or saline. SKIN: Wash with soap and water or 95% ethyl alcohol. INGESTION: If spontaneous vomiting is not prompt and profuse, syrup of ipecac or gastric lavage may be administered. OTHER: Atropinize the victim.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 4;  $LD_{50}$  <50 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: A suspected carcinogen.  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Water.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Toxic fumes of sulfur and nitrogen oxides are emitted.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 75.0 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 20.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
.64-1.4 ppm/96 hr/rainbow trout/LC<sub>50</sub>  
1.9 ppm/bluegill/LC<sub>50</sub>  
1.4 ppm/rainbow trout/LC<sub>50</sub>  
6.2 Waterfowl Toxicity: Duck oral LD<sub>50</sub> = 13 mg/kg  
6.3 Biological Oxygen Demand (BOD): May affect BOD.  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 50 or 75% wettable powder; 5% dust; 4% bait.  
7.2 Storage Temperature: 0° to 100°F  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: P199  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 225.305  
9.3 Boiling Point at 1 atm: Very high.  
9.4 Freezing Point: 250.7°F = 121.5°C = 394.65°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: >1  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 7.77  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# MERCAPTODIMETHUR

MCD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# CHLORODIFLUOROMETHANE

MCF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Eskimon-22 Freon-22 Genetron 22 Isotron 22 Monochlorodifluoromethane Uconn-22	Liquefied compressed gas Colorless Faint odor  Liquid sinks and boils in water. Visible vapor cloud is formed.
<b>Evacuate.</b> Keep people away. Avoid contact with liquid. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Not irritating to eyes, nose or throat. If inhaled, will cause dizziness or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Not harmful to aquatic life.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 36; Halogenated hydrocarbon <b>2.2 Formula:</b> CHClF <sub>2</sub> <b>2.3 IMO/UN Designation:</b> 2.0/1018 <b>2.4 DOT ID No.:</b> 1018 <b>2.5 CAS Registry No.:</b> 75-45-6 <b>2.6 NAERG Guide No.:</b> 126 <b>2.7 Standard Industrial Trade Classification:</b> 51137
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Rubber gloves; goggles. <b>3.2 Symptoms Following Exposure:</b> Inhalation at greater than 10% concentration in air may cause narcosis. Liquid may cause frostbite. <b>3.3 Treatment of Exposure:</b> Remove victim to non-contaminated area and apply artificial respiration if breathing has stopped. Call a physician immediately. Oxygen inhalation may be utilized. <b>3.4 TLV-TWA:</b> 1,000 ppm <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Not pertinent <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> None <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors are nonirritating to the eyes and throat. <b>3.11 Liquid or Solid Characteristics:</b> No appreciable hazard. Practically harmless to the skin because it evaporates quickly. Liquid may cause frostbite. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:**  
Not flammable
- 4.2 Flammable Limits in Air:** Not flammable
- 4.3 Fire Extinguishing Agents:** Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 Special Hazards of Combustion Products:** Decomposition gases are toxic and irritating.
- 4.6 Behavior in Fire:** Not pertinent
- 4.7 Auto Ignition Temperature:** Not flammable
- 4.8 Electrical Hazards:** Not pertinent
- 4.9 Burning Rate:** Not flammable
- 4.10 Adiabatic Flame Temperature:** Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 Flame Temperature:** Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction
- 5.2 Reactivity with Common Materials:** No reaction
- 5.3 Stability During Transport:** Stable
- 5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 Polymerization:** Not pertinent
- 5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
None
- 6.2 Waterfowl Toxicity:** None
- 6.3 Biological Oxygen Demand (BOD):** None
- 6.4 Food Chain Concentration Potential:** None
- 6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Propellant grade
- 7.2 Storage Temperature:** Ambient
- 7.3 Inert Atmosphere:** No requirement
- 7.4 Venting:** Safety relief
- 7.5 IMO Pollution Category:** Currently not available
- 7.6 Ship Type:** Currently not available
- 7.7 Barge Hull Type:** 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Nonflammable gas
- 8.2 49 CFR Class:** 2.2
- 8.3 49 CFR Package Group:** Not pertinent.
- 8.4 Marine Pollutant:** No
- 8.5 NFPA Hazard Classification:** Not listed
- 8.6 EPA Reportable Quantity:** Not listed.
- 8.7 EPA Pollution Category:** Not listed.
- 8.8 RCRA Waste Number:** Not listed
- 8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Gas
- 9.2 Molecular Weight:** 86.48
- 9.3 Boiling Point at 1 atm:** -40.9°F = -40.5°C = 232.7°K
- 9.4 Freezing Point:** Not pertinent
- 9.5 Critical Temperature:** 204.8°F = 96.0°C = 369.2°K
- 9.6 Critical Pressure:** 716 psia = 48.7 atm = 4.93 MN/m<sup>2</sup>
- 9.7 Specific Gravity:** 1.41 at -40°C (liquid)
- 9.8 Liquid Surface Tension:** (est.) 15 dynes/cm = 0.015 N/m at -41°C
- 9.9 Liquid Water Interfacial Tension:** Currently not available
- 9.10 Vapor (Gas) Specific Gravity:** 3.0
- 9.11 Ratio of Specific Heats of Vapor (Gas):** (est.) 1.13
- 9.12 Latent Heat of Vaporization:** 101 Btu/lb = 55.9 cal/g = 2.34 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion:** Not pertinent
- 9.14 Heat of Decomposition:** Not pertinent
- 9.15 Heat of Solution:** Not pertinent
- 9.16 Heat of Polymerization:** Not pertinent
- 9.17 Heat of Fusion:** Currently not available
- 9.18 Limiting Value:** Currently not available
- 9.19 Reid Vapor Pressure:** 212.6 psia

## NOTES

# CHLORODIFLUOROMETHANE

MCF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-110 -105 -100 -95 -90 -85 -80 -75 -70 -65 -60 -55 -50 -45	94.450 93.980 93.509 93.040 92.570 92.110 91.639 91.169 90.700 90.230 89.759 89.299 88.830 88.360		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.300	-110 -105 -100 -95 -90 -85 -80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10	1.696 2.039 2.440 2.904 3.441 4.059 4.767 5.576 6.495 7.536 8.712 10.040 11.520 13.180 15.030 17.090 19.370 21.890 24.680 27.740 31.100 34.780 38.810 43.190 47.960	-110 -105 -100 -95 -90 -85 -80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10	0.03907 0.04632 0.05465 0.06417 0.07500 0.08728 0.10120 0.11680 0.13430 0.15380 0.17560 0.19980 0.22650 0.25610 0.28850 0.32420 0.36320 0.40580 0.45220 0.50260 0.55720 0.61630 0.68010 0.74880 0.82270		C U R R E N T L Y  N O T  A V A I L A B L E

# METHYLCYCLOPENTADIENE DIMER

MCK

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 4,7-Methanoindene, 3a,4,7,7a-tetrahydromethyl- Bis(methylcyclopentadiene) 3a,4,7,7a-Tetrahydromethyl- 4,7-methanoindene	Liquid	Colorless
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Evacuate area.</b> <b>Avoid contact with liquid and vapor.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b>		
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective on fire. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 30; Olefins
- 2.2 Formula: C<sub>12</sub>H<sub>16</sub>
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 26472-00-4
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, protective clothing, rubber boots and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** Harmful if swallowed, inhaled or absorbed through skin. Vapor or mist is irritating to the eyes, mucous membrane, upper respiratory tract. Exposure can cause nausea, headache, and vomiting. May contain 0.5% Benzene, a known carcinogen.
- 3.3 **Treatment of Exposure:** INHALATION: Call a physician. Remove the victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Immediately flush with copious amounts of water for 15 minutes while removing contaminated clothing and shoes. Assure adequate flushing of the eyes by holding eyelids open with fingers.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 7.7 g/kg (mice)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Damage to liver, kidney and lung. Carcinogenic.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of skin and first degree burn on short exposure; may cause second degree burn on long exposure.
- 3.12 **Odor Threshold:** Currently not available.
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 80°F C.C.
- 4.2 **Flammable Limits in Air:** 1%-10%
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam, water sprays.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Vapors may travel considerable distance to a source of ignition and flash back. Forms explosive mixtures in air. Container explosion may occur under fire conditions.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 76.2 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 20.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** No reaction.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (3)  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95%
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** (B)
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 160.26
- 9.3 **Boiling Point at 1 atm:** 392°F = 200°C = 473.2°K
- 9.4 **Freezing Point:** -59.8°F = -51°C = 222.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.941
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 0.93
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYLCYCLOPENTADIENE DIMER

MCK

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	118	0.145		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.246 0.259 0.272 0.284 0.296 0.308 0.320 0.331 0.343 0.354 0.364 0.375 0.385 0.395 0.405 0.414 0.424 0.433 0.442 0.450 0.459 0.467 0.475 0.483 0.491

# METHALLYL CHLORIDE

**MCL**

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> gamma-Chloroisobutylene 3-Chloro-2-methylpropene beta-Methylalyl chloride beta-Methylalyl chloride	Liquid  Colorless to yellow  Sharp penetrating odor  Floats on water. Flammable, irritating vapor is produced.
<b>Evacuate.</b> <b>Keep people away.</b> <b>Shut off ignition sources, call fire department.</b> <b>Stay upwind, use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	FLAMMABLE. Irritating gases may be produced when heated. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Harmful if inhaled. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove Contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_2=\text{C}(\text{CH}_3)\text{CH}_2\text{Cl}$   
2.3 IMO/IUN Designation: 3.2/1993  
2.4 DOT ID No.: 1993  
2.5 CAS Registry No.: 563-47-3  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51134

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister mask; goggles; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact of vapor or liquid with eyes causes irritation. Liquid irritates skin. Ingestion causes irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if breathing stops, give artificial respiration and oxygen; subsequent treatment is symptomatic and supportive. EYES: flush with water for at least 15 min.; get medical attention if exposure has been to liquid. SKIN: flush with water; get medical attention if skin is burned. INGESTION: induce vomiting and follow with gastric lavage, demulcents, and saline cathartics; get medical attention.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 14°F O.C.  
4.2 **Flammable Limits in Air:** 2.3%-9.3%  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride and phosgene vapors may be formed.  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 4.4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 90.55  
9.3 **Boiling Point at 1 atm:** 162.0°F = 72.2°C = 345.4°K  
9.4 **Freezing Point:** <-112°F = <-80°C = <193°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.928 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 32 dynes/cm = 0.032 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.12  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0893  
9.12 **Latent Heat of Vaporization:** 160 Btu/lb = 89 cal/g = 3.7 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -11,600 Btu/lb = -6,500 cal/g = -270 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHALLYL CHLORIDE

MCL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	58.980	52	0.451	52	0.887		N O T
36	58.910	54	0.452	54	0.887		
38	58.840	56	0.453	56	0.887		P E R T I N E N T
40	58.770	58	0.454	58	0.887		
42	58.700	60	0.456	60	0.887		
44	58.640	62	0.457	62	0.887		
46	58.570	64	0.458	64	0.887		
48	58.500	66	0.459	66	0.887		
50	58.430	68	0.460	68	0.887		
52	58.360	70	0.461	70	0.887		
54	58.290	72	0.462	72	0.887		
56	58.220	74	0.463	74	0.887		
58	58.150	76	0.464	76	0.887		
60	58.080	78	0.466	78	0.887		
62	58.010	80	0.467	80	0.887		
64	57.940	82	0.468	82	0.887		
66	57.870	84	0.469	84	0.887		
68	57.800	86	0.470	86	0.887		
70	57.730						
72	57.660						
74	57.590						
76	57.530						
78	57.460						
80	57.390						
82	57.320						
84	57.250						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.100	55	1.411	55	0.02313	0	0.243
		60	1.608	60	0.02610	20	0.250
		65	1.828	65	0.02939	40	0.258
		70	2.073	70	0.03301	60	0.265
		75	2.345	75	0.03699	80	0.272
		80	2.647	80	0.04137	100	0.279
		85	2.981	85	0.04616	120	0.286
		90	3.349	90	0.05140	140	0.292
		95	3.756	95	0.05712	160	0.299
		100	4.203	100	0.06335	180	0.306
		105	4.695	105	0.07013	200	0.312
		110	5.233	110	0.07749	220	0.318
		115	5.822	115	0.08546	240	0.325
		120	6.466	120	0.09409	260	0.331
		125	7.168	125	0.10340	280	0.337
		130	7.932	130	0.11350	300	0.343
		135	8.763	135	0.12430	320	0.348
		140	9.665	140	0.13600	340	0.354
		145	10.640	145	0.14850	360	0.360
		150	11.700	150	0.16190	380	0.365
		155	12.840	155	0.17630	400	0.371
		160	14.080	160	0.19160	420	0.376
		165	15.410	165	0.20800	440	0.382



# MONOCHLOROTRIFLUOROMETHANE

MCM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlorotrifluoromethane F-13 Freon 13 Trifluorochloromethane Trifluoromethyl chloride	Gas                      Colorless                      Odorless
Keep people away. Avoid contact with vapors. Stay upwind; keep out of low areas. Wear self-contained positive pressure breathing apparatus and full protective clothing.	
<b>Fire</b>	Not flammable. Container may explode in heat of fire. Move container from fire area if you can do it without risk. Stay away from ends of tanks. Cool containers that are exposed to flames with water from the side until well after fire is out. Withdraw immediately in case of rising sounds from safety device or any discoloration of tanks due to fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  <b>VAPORS</b> Vapors may be harmful if inhaled. Vapors may cause dizziness or suffocation. Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Contact with liquid may cause frostbite. Remove contaminated clothing and shoes. Flush affected areas with plenty of lukewarm water. <b>DO NOT USE HOT WATER.</b>
<b>Water Pollution</b>	Not pertinent.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: CClF<sub>3</sub>
- 2.3 IMO/UN Designation: 2.2/1022
- 2.4 DOT ID No.: 1022
- 2.5 CAS Registry No.: 75-72-9
- 2.6 NAERG Guide No.: 126
- 2.7 Standard Industrial Trade Classification: 51137

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, safety goggles, rubber gloves, safety shoes.
- 3.2 **Symptoms Following Exposure:** Exposure may cause nausea, dizziness, and headache, and rapid suffocation. Contact with skin may cause frostbite.
- 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SKIN: Wash affected areas with warm water. DO NOT USE HOT WATER.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. Contact may cause frostbite.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic fumes of Cl and F
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Non hazardous
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99 + %
- 7.2 **Storage Temperature:** Below 130°F
- 7.3 **Inert Atmosphere:** Not pertinent
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Nonflammable Gas
- 8.2 **49 CFR Class:** 2.2
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 104.46
- 9.3 **Boiling Point at 1 atm:** -114°F = -81°C = 192°K
- 9.4 **Freezing Point:** -294°F = -181°C = 92°K
- 9.5 **Critical Temperature:** 83.9°F = 28.85°C = 302.05°K
- 9.6 **Critical Pressure:** 561.4 psia = 38.2 atm = 3.9 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.298 at -30°C
- 9.8 **Liquid Surface Tension:** 14 dyne/cm = .014 N/m at -73.3°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 3.60
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** 76.1 Btu/lb = 42.3 cal/g = 1.77 x 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 480 psia

### NOTES

# MONOCHLOROTRIFLUOROMETHANE

MCM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	77	0.240	77	0.016

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.009	-230 -220 -210 -200 -190 -180 -170 -160 -150 -140 -130	0.053 0.089 0.151 0.255 0.431 0.728 1.230 2.078 3.511 5.932 10.023	-114	0.44000	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.099 0.101 0.104 0.106 0.108 0.111 0.113 0.116 0.118 0.121 0.123 0.126 0.128 0.130 0.133 0.135 0.138 0.140 0.143 0.145 0.148 0.150 0.153 0.155 0.157

# MERCURIC CYANIDE

MCN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cianurina Mercury cyanide Mercury (II) cyanide	Solid (crystals or powder)      White  Sinks and mixes slowly with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear a dust respirator and rubber overclothing (including gloves). Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: Hg(CN) <sub>2</sub> 2.3 IMO/UN Designation: 6.1/1636 2.4 DOT ID No.: 1636 2.5 CAS Registry No.: 592-04-1 2.6 NAERG Guide No.: 154 2.7 Standard Industrial Trade Classification: 52381
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Dust mask; goggles or face shield; rubber gloves 3.2 <b>Symptoms Following Exposure:</b> Symptoms of both cyanide and mercury intoxication can occur. Acute poisoning has resulted from inhaling dust concentrations of 1.2-8.5 mg/m <sup>3</sup> of air; symptoms include tightness and pain in chest, coughing, and difficulty in breathing; cyanide poisoning can cause anxiety, confusion, dizziness, and shortness of breath, with possible unconsciousness, convulsions, and paralysis; breath may smell like bitter almonds. Ingestion causes necrosis, pain, vomiting, and severe purging, plus the above symptoms. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin. 3.3 <b>Treatment of Exposure:</b> Act quickly; call physician. INHALATION: if victim has stopped breathing, start artificial respiration immediately; using amyl nitrite pearls, administer amyl nitrite by inhalation for 15-30 seconds of every minute while sodium nitrite solution is being prepared; discontinue amyl nitrite and immediately inject intravenously 10 ml of a 3% solution of sodium nitrite (nonsterile if necessary) over a period of 2-4 min.; without removing needle, infuse intravenously 50 ml of a 25% aqueous solution of sodium thiosulfate; injection should take about 10 min. (concentrations of 5-50% may be used, but keep total dose approx. 12 gm). Oxygen therapy may be helpful in combination with the above. INGESTION: alimentary absorption is very rapid; action during first 10-15 min. determines prognosis. Give egg whites, milk, or activated charcoal and induce vomiting; treat for cyanide poisoning as above. EYES or SKIN: wash with water for 15 min. 3.4 TLV-TWA: 0.025 mg/m <sup>3</sup> (as mercury) 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 4; oral LD <sub>50</sub> = 25 mg/kg (rat) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Odorless 3.13 IDLH Value: Currently not available 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: 0.1 mg/m <sup>3</sup> (as mercury) 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Fumes from fire may contain toxic mercury and hydrogen cyanide.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Contact with any acidic material will form poisonous hydrogen cyanide gas, which may collect in enclosed spaces.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.02 ppm/48 hr/daphnia magna/TL<sub>m</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Possible bioaccumulation problem. Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: Yes
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: 1 pound
- 8.7 EPA Pollution Category: X
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 252.63
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 4.0 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# MERCURIC CYANIDE

MCN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	6.700		N		N		N
36	6.900		O		O		O
38	7.100		T		T		T
40	7.300						
42	7.500		P		P		P
44	7.700		E		E		E
46	7.900		R		R		R
48	8.100		T		T		T
50	8.300		I		I		I
52	8.500		N		N		N
54	8.700		E		E		E
56	8.900		N		N		N
58	9.100		E		E		E
60	9.300		N		N		N
62	9.500		T		T		T
64	9.700						
66	9.900						
68	10.100						
70	10.300						
72	10.500						
74	10.700						
76	10.900						
78	11.100						
80	11.300						
82	11.500						
84	11.700						

# METOLACHLOR

MCO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> CGA24705 Codal Cotoran multi Dual Metellachlor Milocep Ontrack 8e Primagram Primextra	Oily liquid  Tan to brown  Slightly soluble; sinks in water.	Slightly sweet
<b>Keep people away. Avoid contact with liquid and vapor.</b> <b>Wear approved chemical cartridge respirator, safety goggles, and full protective clothing.</b> <b>Notify local health and pollution control agencies.</b>		
<b>Fire</b>	Combustible Wear self contained breathing apparatus and full protective clothing. Extinguish with dry chemical, alcohol foam or CO <sub>2</sub> .	
<b>Exposure</b>	CALL FOR MEDICAL AID Liquid Irritating to skin and eyes; harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eye lids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS have victim drink water and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 34; Esters 2.2 Formula: C <sub>15</sub> H <sub>2</sub> ClNO <sub>2</sub> 2.3 IMO/UN Designation: Currently not available 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 51218-45-2 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51140
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> In case of spill: Wear chemical safety glasses or goggles, rubber gloves, waterproof boots, and approved chemical cartridge respirator. In case of fire: Wear full protective clothing and self contained breathing apparatus. 3.2 <b>Symptoms Following Exposure:</b> Can cause skin irritation and eye irritation. Headache and nausea may occur following prolong exposure. 3.3 <b>Treatment of Exposure:</b> INHALATION: Call for medical aid. Move victim from contaminated area to fresh air. Apply artificial respiration if necessary. INGESTION: If victim is conscious administer 1,2 glasses of water and induce vomiting. EYES: Immediately rinse with large amounts of running water. Do not apply any medication, unless advised by a physician. SKIN: Wash with soap and plenty of water including hair and undernails. Do not apply any medication except on the advice of a physician. Remove clothing and wash before reuse. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 2.75 g/kg (Rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> May be tumorigenic. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapor can cause slight smarting to eyes or respiratory system, if present in high concentration. 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard, if spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 3.12 <b>Odor Threshold:</b> Currently not available. 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** >230°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** 510°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 96.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 27.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Will not occur
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** liquid
- 9.2 **Molecular Weight:** 283.81
- 9.3 **Boiling Point at 1 atm:** 212°F = 100°C = 373.2°K (at 0.001mm Hg)
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.12
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 9.79
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# METOLACHLOR

MCO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.245 0.257 0.269 0.281 0.292 0.303 0.314 0.325 0.336 0.346 0.357 0.367 0.376 0.386 0.396 0.405 0.414 0.423 0.432 0.440 0.449 0.457 0.465 0.473 0.481

# METHYL CYCLOPENTANE

MCP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cyclopentane, methyl	Liquid Colorless Gasoline-like odor  Floats on water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR If inhaled will cause dizziness or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>5</sub>H<sub>12</sub>  
2.3 IMO/UN Designation: 3.1/2298  
2.4 DOT ID No.: 2298  
2.5 CAS Registry No.: 96-37-7  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; goggles or face shield; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Inhalation causes dizziness, nausea, and vomiting; concentrated vapor may cause unconsciousness and collapse. Liquid causes irritation of eyes and mild irritation of skin if allowed to remain. Ingestion causes irritation of stomach. Aspiration causes severe lung irritation, rapidly developing pulmonary edema, and central nervous system excitement followed by depression.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; if breathing has stopped, begin artificial respiration; call physician. EYES: flush with water for 15 min.; call physician. SKIN: flush well with water, then wash with soap and water. INGESTION: do NOT induce vomiting; guard against aspiration into lungs. ASPIRATION: enforce bed rest; give oxygen; get medical attention.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** <0°F C.C.
- 4.2 **Flammable Limits in Air:** 1.1%-8.7% (approx.)
- 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 624°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 7.1 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: 3  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research: 99.94%; Pure: 99.5%; Technical: 96.5%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 84.2
- 9.3 **Boiling Point at 1 atm:** 161.3°F = 71.8°C = 345.0°K
- 9.4 **Freezing Point:** -224°F = -142°C = 131°K
- 9.5 **Critical Temperature:** 499.3°F = 259.6°C = 532.8°K
- 9.6 **Critical Pressure:** 550 psia = 37.4 atm = 3.79 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.749 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 21.60 dynes/cm = 0.0216 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 35 dynes/cm = 0.035 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** 2.9
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0834
- 9.12 **Latent Heat of Vaporization:** 162 Btu/lb = 90 cal/g = 3.8 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** (liquid) -18,900 Btu/lb = -10,500 cal/g = -440 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 19.68 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL CYCLOPENTANE

MCP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	47.900	34	0.525	65	0.841	15	0.741
40	47.730	36	0.526	70	0.835	20	0.712
45	47.550	38	0.527	75	0.829	25	0.684
50	47.380	40	0.528	80	0.823	30	0.659
55	47.210	42	0.528	85	0.817	35	0.635
60	47.030	44	0.529	90	0.811	40	0.612
65	46.860	46	0.530	95	0.805	45	0.590
70	46.680	48	0.531	100	0.799	50	0.569
75	46.510	50	0.532	105	0.793	55	0.550
80	46.340	52	0.533	110	0.788	60	0.532
85	46.160	54	0.534	115	0.782	65	0.514
90	45.990	56	0.535	120	0.776	70	0.498
95	45.820	58	0.536	125	0.770	75	0.482
100	45.640	60	0.536	130	0.764	80	0.467
		62	0.537			85	0.453
		64	0.538			90	0.439
		66	0.539			95	0.426
		68	0.540			100	0.414
		70	0.541			105	0.402
		72	0.542			110	0.391
		74	0.543			115	0.380
		76	0.544			120	0.370
		78	0.544				
		80	0.545				
		82	0.546				
		84	0.547				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	55	1.493	55	0.02275	50	0.295
	N	60	1.697	60	0.02562	60	0.301
	S	65	1.925	65	0.02877	70	0.308
	O	70	2.177	70	0.03224	80	0.314
	L	75	2.458	75	0.03605	90	0.320
	U	80	2.768	80	0.04023	100	0.327
	B	85	3.110	85	0.04479	110	0.333
	L	90	3.488	90	0.04977	120	0.339
	E	95	3.903	95	0.05519	130	0.346
		100	4.359	100	0.06109	140	0.352
		105	4.858	105	0.06748	150	0.359
		110	5.405	110	0.07442	160	0.365
		115	6.001	115	0.08191	170	0.371
		120	6.652	120	0.09001	180	0.378
		125	7.360	125	0.09874	190	0.384
		130	8.130	130	0.10810	200	0.390
		135	8.965	135	0.11820	210	0.397
		140	9.870	140	0.12910	220	0.403
		145	10.850	145	0.14070	230	0.409
		150	11.910	150	0.15320	240	0.416
		155	13.050	155	0.16650	250	0.422
		160	14.280	160	0.18070	260	0.429
		165	15.600	165	0.19590		



# MERCURY

MCR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Quicksilver	Liquid Silver Odorless  Sinks in water.
Keep people away. AVOID CONTACT WITH LIQUID. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Effects of exposure may be delayed.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: Hg
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2809
- 2.5 CAS Registry No.: 7439-97-6
- 2.6 NAERG Guide No.: 172
- 2.7 Standard Industrial Trade Classification: 52227

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Avoid contact of liquid with skin. For vapor use chemical cartridge (Hopcalite) respirator.
- 3.2 **Symptoms Following Exposure:** No immediate symptoms. As poisoning becomes established, slight muscular tremor, loss of appetite, nausea, and diarrhea are observed. Psychic, kidney, and cardiovascular disturbances may occur.
- 3.3 **Treatment of Exposure:** Consult a doctor.
- 3.4 **TLV-TWA:** 0.025 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** No immediate toxicity
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Development of mercury poisoning
- 3.10 **Vapor (Gas) Irritant Characteristics:** None
- 3.11 **Liquid or Solid Characteristics:** None
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** 0.1 mg/m<sup>3</sup>
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not flammable
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.5-1 ppm/48 hr/caragius  
ardium/TLW/fresh water  
0.29 ppm/48 hr/marine fish/TLW/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Mercury concentrates in liver and kidneys of ducks and geese to levels above FDA limit of 0.5 ppm. Muscle tissue usually well below the limit.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** U155/D009
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 200.59
- 9.3 **Boiling Point at 1 atm:** 675°F = 357°C = 630°K
- 9.4 **Freezing Point:** -38.0°F = -38.9°C = 234.3°K
- 9.5 **Critical Temperature:** 2663.6°F = 1462°C = 1735.2°K
- 9.6 **Critical Pressure:** 23,300 psia = 1587 atm = 160.8 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 13.55 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 470 dynes/cm = 0.470 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** 375 dynes/cm = 0.375 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 2.7 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# MERCURY

MCR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	851.399	35	0.033		N	0	1.827
5	851.000	40	0.033		O	5	1.801
10	850.500	45	0.033		T	10	1.777
15	850.099	50	0.033			15	1.754
20	849.699	55	0.033		P	20	1.731
25	849.199	60	0.033		E	25	1.709
30	848.799	65	0.033		R	30	1.688
35	848.399	70	0.033		T	35	1.668
40	847.899	75	0.033		I	40	1.648
45	847.500	80	0.033		N	45	1.629
50	847.099	85	0.033		E	50	1.610
55	846.599	90	0.033		N	55	1.592
60	846.199	95	0.033		T	60	1.575
65	845.799	100	0.033			65	1.558
70	845.299					70	1.541
75	844.899					75	1.525
80	844.500					80	1.510
85	844.000					85	1.495
90	843.599					90	1.480
95	843.199					95	1.466
100	842.699					100	1.452

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# METHYLDICHLOROSILANE

MCS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Liquid  Colorless  Sharp irritating odor  Reacts violently with water. Irritating gas is produced on contact with water.
Evacuate. KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR. Wear goggles and self-contained breathing apparatus. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE. DO NOT USE WATER OR FOAM ON ADJACENT FIRES.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CH<sub>3</sub>SiHCl<sub>2</sub>  
2.3 IMO/UN Designation: 3.2/1242  
2.4 DOT ID No.: 1242  
2.5 CAS Registry No.: 75-54-7  
2.6 NAERG Guide No.: 139  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full protective clothing; acid-vapor-type respiratory protection; rubber gloves; chemical worker's goggles; other protective equipment as necessary to protect skin and eyes.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory tract; heavy exposure can cause pulmonary edema. Contact of liquid with skin or eyes causes severe burns. Ingestion causes burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove victim from exposure; if breathing has stopped, begin artificial respiration. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; give large amounts of water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** -14°F O.C.  
4.2 **Flammable Limits in Air:** 6%-55%  
4.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam  
4.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene gases may be formed.  
4.6 **Behavior in Fire:** Difficult to extinguish; re-ignition may occur. Contact with water applied to adjacent fires will generate irritating hydrogen chloride gas.  
4.7 **Auto Ignition Temperature:** >600  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 3.0 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 11.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently to form hydrogen chloride (hydrochloric acid)  
5.2 **Reactivity with Common Materials:** Reacts with surface moisture to evolve hydrogen chloride, which is corrosive to common metals.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water and rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: (1)  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Dangerous When Wet  
8.2 **49 CFR Class:** 4.3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 2              |
| Special (White).....      | W              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 115  
9.3 **Boiling Point at 1 atm:** 106.7°F = 41.5°C = 314.7°K  
9.4 **Freezing Point:** -135°F = -93°C = 180°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.11 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 35 dynes/cm = 0.035 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 106 Btu/lb = 59 cal/g = 2.5 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -4,700 Btu/lb = -2,600 cal/g = -110 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYLDICHLOROSILANE

MCS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	70.469	51	0.350	52	0.839	51	9.018
36	70.400	52	0.350	54	0.839	52	8.773
38	70.330	53	0.350	56	0.839	53	8.535
40	70.259	54	0.350	58	0.839	54	8.305
42	70.190	55	0.350	60	0.839	55	8.082
44	70.120	56	0.350	62	0.839	56	7.865
46	70.049	57	0.350	64	0.839	57	7.656
48	69.980	58	0.350	66	0.839	58	7.452
50	69.910	59	0.350	68	0.839	59	7.255
52	69.839	60	0.350	70	0.839	60	7.064
54	69.770	61	0.350	72	0.839	61	6.879
56	69.700	62	0.350	74	0.839	62	6.699
58	69.639	63	0.350	76	0.839	63	6.524
60	69.570	64	0.350	78	0.839	64	6.355
62	69.500	65	0.350	80	0.839	65	6.190
64	69.429	66	0.350	82	0.839	66	6.031
66	69.360	67	0.350	84	0.839	67	5.876
68	69.290	68	0.350	86	0.839	68	5.726
70	69.219	69	0.350	88	0.839	69	5.580
72	69.150	70	0.350			70	5.438
74	69.080	71	0.350			71	5.301
76	69.009	72	0.350			72	5.167
78	68.940	73	0.350			73	5.037
80	68.870	74	0.350			74	4.911
82	68.799	75	0.350			75	4.789
84	68.730	76	0.350			76	4.670

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	70	6.841	70	0.13840		N
	E	72	7.149	72	0.14400		O
	A	74	7.467	74	0.14990		T
	C	76	7.797	76	0.15590		
	T	78	8.139	78	0.16220		P
	S	80	8.493	80	0.16860		E
		82	8.860	82	0.17520		R
		84	9.240	84	0.18210		T
		86	9.633	86	0.18910		I
		88	10.040	88	0.19640		N
		90	10.460	90	0.20390		E
		92	10.900	92	0.21160		N
		94	11.350	94	0.21950		T
		96	11.810	96	0.22770		
		98	12.290	98	0.23610		
		100	12.790	100	0.24480		
		102	13.300	102	0.25370		
		104	13.830	104	0.26290		
		106	14.380	106	0.27230		
		108	14.940	108	0.28200		
		110	15.530	110	0.29200		
		112	16.130	112	0.30220		

# METHYLCYCLOPENTADIENYLMANGANESE TRICARBONYL

MCT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Combustion improver C-12	Liquid	Yellow to dark orange	Faint pleasant odor
	Sinks in water.		
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID.</b> Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. If swallowed will cause loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_5H_5O_3Mn$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 12079-65-1  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor canister mask; rubber gloves and apron; protective goggles or face shield.  
3.2 **Symptoms Following Exposure:** Inhalation, ingestion, or skin contact affect central nervous system, causing convulsions, respiratory depression, cyanosis, and coma. Liquid irritates eyes.  
3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove victim from exposure; administer artificial respiration if necessary. EYES: flush with plenty of water for at least 15 min. SKIN: wash well with soap and water. INGESTION: induce vomiting.  
3.4 **TLV-TWA:** 0.1 mg/m<sup>3</sup> (as manganese)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; oral LD<sub>50</sub> = 23 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 5 mg/m<sup>3</sup> (as manganese)  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
>200°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, water spray, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic vapors are formed in a fire.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 48.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.8%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 218.1  
9.3 **Boiling Point at 1 atm:** 451°F = 233°C = 506°K  
9.4 **Freezing Point:** 34°F = 1°C = 274°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.39 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -9,900 Btu/lb = -5,500 cal/g = -230 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

### NOTES

# METHYLCYCLOPENTADIENYLMANGANESE TRICARBONYL

MCT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	87.950	52	0.300		N		N
36	87.879	54	0.300		O		O
38	87.809	56	0.300		T		T
40	87.740	58	0.300				
42	87.669	60	0.300		P		P
44	87.599	62	0.300		E		E
46	87.530	64	0.300		R		R
48	87.459	66	0.300		T		T
50	87.389	68	0.300		I		I
52	87.320	70	0.300		N		N
54	87.250	72	0.300		E		E
56	87.179	74	0.300		N		N
58	87.110	76	0.300		T		T
60	87.040	78	0.300				
62	86.969	80	0.300				
64	86.910	82	0.300				
66	86.839	84	0.300				
68	86.770	86	0.300				
70	86.700						
72	86.629						
74	86.559						
76	86.490						
78	86.419						
80	86.349						
82	86.280						
84	86.209						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.007	60	0.001	60	0.00003		N
		70	0.001	70	0.00004		O
		80	0.002	80	0.00006		T
		90	0.003	90	0.00010		
		100	0.004	100	0.00014		P
		110	0.006	110	0.00021		E
		120	0.009	120	0.00031		R
		130	0.013	130	0.00044		T
		140	0.018	140	0.00062		I
		150	0.026	150	0.00086		N
		160	0.036	160	0.00119		E
		170	0.050	170	0.00162		N
		180	0.069	180	0.00220		T
		190	0.094	190	0.00294		
		200	0.127	200	0.00391		
		210	0.170	210	0.00515		

# O-METHYLCYCLOHEXANONE

MCX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Methylcyclohexanone	Liquid	Colorless	Weak peppermint odor
	Floats on water.		
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with alcohol foam, dry chemical, or carbon dioxide.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, give large quantity of water. After swallowing water, induce vomiting.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_8H_{14}(O)(CH_3)$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: 2297  
2.5 CAS Registry No.: 583-60-8  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51628

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Impervious clothing and gloves should be used to prevent skin contact. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** May cause irritation of the eyes, nose and throat. Prolonged or repeated contact may cause dermatitis.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. Contact lenses should not be worn when working with this chemical. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. INGESTION: Give the victim large quantity of water. After swallowing the water, induce vomiting.
- 3.4 TLV-TWA: 50 ppm  
3.5 TLV-STEL: 75 ppm  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Repeated or prolonged overexposure may cause dermatitis. In animals it has caused drowsiness, skin irritation, tremors, narcosis, and death.  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 600 ppm  
3.14 OSHA PEL-TWA: 100 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 118°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide.  
4.4 Fire Extinguishing Agents Not to Be Used: Water.  
4.5 Special Hazards of Combustion Products: Irritating vapors and toxic gases, such as carbon monoxide, may be formed when involved in fire.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not listed.  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 45.2 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 13.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical grades.  
7.2 Storage Temperature: Ambient.  
7.3 Inert Atmosphere: No requirement.  
7.4 Venting: Not listed.  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	-
Flammability (Red).....	2
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.  
5.2 Reactivity with Common Materials: Contact with strong oxidizers may cause fires and explosions.  
5.3 Stability During Transport: Stable.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.  
5.5 Polymerization: Will not polymerize.  
5.6 Inhibitor of Polymerization: Not pertinent.

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 112.2  
9.3 Boiling Point at 1 atm: 329°F = 165°C = 438°K  
9.4 Freezing Point: -6.8°F = -14°C = 259°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 0.93  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 3.9  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent.  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

### NOTES

# O-METHYLCYCLOHEXANONE

MCX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	68	0.019	68	0.00038		C U R R E N T L Y  N O T  A V A I L A B L E



# METHYLCYCLOHEXANE

MCY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cyclohexylmethane Hexahydrotoluene Sextone B Toluene, hexahydro UN 2296 (DOT)	Liquid	Colorless	Faint benzene-like odor
<b>Keep people away. Evacuate area. Shut off ignition sources. Call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.</b>			
<b>Fire</b>	FLAMMABLE: Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective on fire. Wear self-contained breathing apparatus and protective clothing. Extinguish with alcohol foam, dry chemical or CO <sub>2</sub> . Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, lightheadness, drowsiness, nausea, vomiting or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 31; Paraffins
- 2.2 Formula: C<sub>6</sub>H<sub>12</sub>:CH<sub>2</sub>
- 2.3 IMO/UN Designation: 3.2/2296
- 2.4 DOT ID No.: 2296
- 2.5 CAS Registry No.: 108-87-2
- 2.6 NAERG Guide No.: 128
- 2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Currently not available
- 3.2 **Symptoms Following Exposure:** Harmful if inhaled or swallowed. Vapor or mist is irritating to the eyes, mucous membrane and upper respiratory tract and skin. Narcotic effects and dermatitis.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing give artificial respiration. If breathing is difficult give oxygen. SKIN: Wash with soap and copious amounts of water. Immediate medical attention. EYES: Flush with copious amounts of water for at least 15 minutes.
- 3.4 **TLV-TWA:** 400 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 2.25 g/kg mouse
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 1,200 ppm
- 3.14 **OSHA PEL-TWA:** 500 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 25°F C.C.
- 4.2 **Flammable Limits in Air:** LEL 1.1%; UEL 6.7%
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Vapor may travel considerable distance to a source of ignition and flashback containing explosion may occur during fire conditions. Forms explosive mixtures in air.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** 482°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Will not occur
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** (C)
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 98.21
- 9.3 **Boiling Point at 1 atm:** 213.8°F = 101°C = 374.2°K
- 9.4 **Freezing Point:** -194.8°F = -126°C = 147.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.770
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 3.4
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 1.611 psia

### NOTES

# METHYLCYCLOHEXANE

MCY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	-33 7 26 48 68 72 87 100 108 139 175 214	0.019 0.097 0.193 0.387 0.716 0.774 1.160 1.611 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.269 0.288 0.306 0.325 0.343 0.361 0.378 0.395 0.412 0.429 0.445 0.461 0.477 0.492 0.507 0.522 0.536 0.550 0.564 0.578 0.591 0.604 0.617 0.630 0.642

# METHYL DICHLOROACETATE

MDC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dichloroacetic acid, methyl ester Methyl dichloroethanoate	Liquid  Colorless  Ethereal odor  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear self-contained breathing apparatus and full protective clothing. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Toxic fumes emitted when heated. Wear self-contained breathing apparatus and full protective clothing. Extinguish with CO <sub>2</sub> , dry chemical, or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Harmful if inhaled or absorbed through the skin. Highly irritating to skin, eyes, and mucous membranes. Hydrolyzes upon contact with moisture to form vapors corrosive to tissue. Remove victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed or absorbed through the skin. Corrosive to eyes, skin, nose, throat, and upper respiratory tract. Hydrolyzes upon contact with moisture to form vapors corrosive to skin. IF IN EYES: hold eyelids open, flush with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes; flush affected areas with water. IF SWALLOWED: do nothing except keep victim warm. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Cl<sub>2</sub>CHCO<sub>2</sub>CH<sub>3</sub>  
2.3 IMO/UN Designation: 6.1/2299  
2.4 DOT ID No.: 2299  
2.5 CAS Registry No.: 116-54-1  
2.6 NAERG Guide No.: 155  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, chemical-resistant gloves, safety goggles or safety faceshield (8 inch minimum), other protective clothing.
- 3.2 **Symptoms Following Exposure:** Extremely destructive to the eyes, nose, throat, and upper respiratory tract. May be fatal as a result of spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.
- 3.3 **Treatment of Exposure:** Call a physician. EYES: Hold eyelids open, flush with water for at least 15 minutes. SKIN: Remove contaminated clothing, flush affected areas with water. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Do nothing except keep victim warm. DO NOT INDUCE VOMITING.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 176°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** CO<sub>2</sub>, dry chemical powder, or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Produces toxic fumes of phosgene and HCl.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 11.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Hydrolyzes to form corrosive products.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: (1)  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	-
Flammability (Red).....	1
Instability (Yellow).....	1

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 142.97  
9.3 **Boiling Point at 1 atm:** 289°F = 143°C = 416°K  
9.4 **Freezing Point:** -62°F = -52°C = 221°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.3774 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.93  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL DICHLOROACETATE

MDC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	85.990		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.153 0.158 0.163 0.168 0.173 0.178 0.183 0.188 0.192 0.197 0.201 0.205 0.210 0.214 0.218 0.222 0.226 0.230 0.233 0.237 0.241 0.244 0.247 0.251 0.254

# METHYL DIETHANOLAMINE

MDE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> MDEA 2,2'-Methyliminodiethanol		Liquid	Colorless
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 8; Alkanolamines
- 2.2 Formula: (HOCH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>NCH<sub>3</sub>
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: Not listed.
- 2.5 CAS Registry No.: 105-59-9
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 4.78 g/kg (rat).
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 258.8°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as nitrogen oxides and carbon monoxide, may be formed when involved in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 39.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%; technical grades.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Open.
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 119.16
- 9.3 **Boiling Point at 1 atm:** 474.8 - 478.4°F = 246 - 248°C = 519 - 521°K
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.0377 @ 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL DIETHANOLAMINE

MDE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	8.660		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# MONOETHANOLAMINE

MEA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Aminoethanol beta-Aminoethyl alcohol Ethanolamine 2-Hydroxyethylamine	Oily liquid  Colorless  Slight ammonia odor  Sinks and mixes with water. Freezing point is 51°F.
Avoid contact with liquid. Wear goggles and self-contained breathing apparatus. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 8; Alkanolamine  
2.2 Formula: HOCH<sub>2</sub>CH<sub>2</sub>NH<sub>2</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2491  
2.5 CAS Registry No.: 141-43-5  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full face shield; goggles; eye wash facility.  
3.2 **Symptoms Following Exposure:** Vapor irritates eyes and nose. Liquid causes local injury to mouth, throat, digestive tract, skin, and eyes.  
3.3 **Treatment of Exposure:** INGESTION: induce vomiting by giving large volumes of warm salt water (2 tablespoons per glass); call a doctor. EYES: flush with water for at least 15 min.; call a doctor. SKIN: flush with water.  
3.4 **TLV-TWA:** 3 ppm  
3.5 **TLV-STEL:** 6 ppm  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 30 ppm  
3.14 **OSHA PEL-TWA:** 3 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 200°F O.C. 185°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray, alcohol foam, dry chemical or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating vapors generated when heated.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 20.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 7100 ppm/48 hr/shrimp/LC<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 78%, 5 days; (theor.) 0%, 5 days; 64%, 20 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** NF: 85% (15% water); commercial: 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 61.08  
9.3 **Boiling Point at 1 atm:** 338°F = 170°C = 443°K  
9.4 **Freezing Point:** 50.5°F = 10.3°C = 283.5°K  
9.5 **Critical Temperature:** 645.8°F = 341°C = 614.2°K  
9.6 **Critical Pressure:** 647 psia = 44 atm = 4.45 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.016 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 360 Btu/lb = 200 cal/g = 8.37 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -10,710 Btu/lb = -5950 cal/g = -249 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -17 Btu/lb = -10 cal/g = -0.4 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.01 psia

### NOTES

# MONOETHANOLAMINE

MEA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
55	63.750	52	0.541		N		C
60	63.600	54	0.542		O		U
65	63.460	56	0.543		T		R
70	63.310	58	0.544				R
75	63.170	60	0.545		P		E
80	63.020	62	0.547		E		N
85	62.880	64	0.548		R		T
90	62.730	66	0.549		T		L
95	62.580	68	0.550		I		Y
100	62.440	70	0.551		N		
105	62.290	72	0.552		E		N
110	62.150	74	0.553		N		O
115	62.000	76	0.554		T		T
120	61.860	78	0.555				
125	61.710	80	0.557				A
130	61.570	82	0.558				V
135	61.420	84	0.559				A
140	61.270	86	0.560				I
145	61.130						L
150	60.980						A
155	60.840						B
160	60.690						L
165	60.550						E
170	60.400						
175	60.250						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	60	0.004	60	0.00004		N
	I	70	0.006	70	0.00007		O
	S	80	0.010	80	0.00010		T
	C	90	0.015	90	0.00015		
	I	100	0.022	100	0.00022		P
	B	110	0.032	110	0.00032		E
	L	120	0.046	120	0.00045		R
	E	130	0.066	130	0.00064		T
		140	0.094	140	0.00089		I
		150	0.131	150	0.00122		N
		160	0.181	160	0.00166		E
		170	0.248	170	0.00224		N
		180	0.337	180	0.00300		T
		190	0.452	190	0.00396		
		200	0.602	200	0.00520		
		210	0.795	210	0.00676		
		220	1.042	220	0.00872		
		230	1.354	230	0.01117		
		240	1.746	240	0.01420		
		250	2.235	250	0.01792		
		260	2.842	260	0.02247		
		270	3.591	270	0.02800		
		280	4.508	280	0.03468		
		290	5.625	290	0.04269		
		300	6.977	300	0.05226		



# METHYL CHLOROACETATE

MED

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chloroacetic acid, methyl ester Methyl monochloroacetate Monochloroacetic acid, methyl ester	Liquid	Colorless
Sinks and mixes with water.		
Keep people away. Avoid contact with liquid and vapor. Wear self-contained breathing apparatus and full protective clothing. Notify local health and pollution control agencies.		
<b>Fire</b>	Combustible Emits toxic fumes under fire conditions. Flashback may occur along vapor trail. Wear self-contained breathing apparatus and full protective clothing. Extinguish fires with CO <sub>2</sub> , dry chemical, or alcohol foam.	
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR Harmful if inhaled or absorbed through the skin. Irritating to the eyes, nose, and throat. Remove victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed or absorbed through the skin. Corrosive to skin, eyes, nose, throat, and upper respiratory tract. Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES: hold eyelids open, flush with running water for at least 15 minutes. IF SWALLOWED: do nothing except keep victim warm. DO NOT INDUCE VOMITING	
<b>Water Pollution</b>	Harmful to aquatic life. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: CICH <sub>2</sub> CO <sub>2</sub> CH <sub>3</sub> 2.3 IMO/UN Designation: 3.3/2295 2.4 DOT ID No.: 2295 2.5 CAS Registry No.: 96-34-4 2.6 NAERG Guide No.: 155 2.7 Standard Industrial Trade Classification: 51372
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Approved respirator, chemical safety goggles, chemical-resistant gloves, other protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Extremely corrosive to the eyes, skin, nose, throat, and upper respiratory tract. Inhalation may be fatal as a result of spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. 3.3 <b>Treatment of Exposure:</b> Call a physician. EYES: Hold eyelids open, flush with running water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes. Flush affected areas with water for at least 15 minutes. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Do nothing except keep victim warm. DO NOT INDUCE VOMITING 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 3; LD <sub>50</sub> = 240 mg/kg (mouse) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes. 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 125°F C.C.  
4.2 Flammable Limits in Air: 7.5-18.5%  
4.3 Fire Extinguishing Agents: CO<sub>2</sub>, dry chemical, alcohol foam  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective against fire.  
4.5 Special Hazards of Combustion Products: Toxic fumes of hydrogen chloride  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 869°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 19.0 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 6.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: 2  
Human Contact hazard: -  
Reduction of amenities: -

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99+%  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: None  
7.4 Venting: None  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	1

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 108.52  
9.3 Boiling Point at 1 atm: 266°F = 129.8°C = 403°K  
9.4 Freezing Point: -26°F = -32.1°C = 241°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 1.2337 at 20°C  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 3.8  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.32 psia

## NOTES

# METHYL CHLOROACETATE

MED

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	77.020		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200	0.018 0.040 0.076 0.127 0.198 0.290 0.406 0.549 0.722 0.926 1.164 1.439 1.753 2.109 2.508 2.954 3.448 3.993		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.184 0.190 0.196 0.202 0.207 0.213 0.219 0.224 0.230 0.235 0.240 0.246 0.251 0.256 0.261 0.266 0.271 0.276 0.280 0.285 0.289 0.294 0.298 0.302 0.307

# METHYL ETHYL KETONE

**MEK**

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Butanone Ethyl methyl ketone MEK	Liquid  Colorless  Sweet odor  Floats and mixes with water. Flammable, irritating vapor is produced.
Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 18; Ketone  
2.2 Formula:  $\text{CH}_3\text{COCH}_2\text{CH}_3$   
2.3 IMO/UN Designation: 3.2/1193  
2.4 DOT ID No.: 1193  
2.5 CAS Registry No.: 78-93-3  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister or air pack; plastic gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Liquid causes eye burn. Vapor irritates eyes, nose, and throat; can cause headache, dizziness, nausea, weakness, and loss of consciousness.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if breathing is irregular or has stopped, start resuscitation and administer oxygen. EYES: wash with plenty of water for at least 15 min. and call physician.  
3.4 **TLV-TWA:** 200 ppm  
3.5 **TLV-STEL:** 300 ppm  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 10 ppm  
3.13 **IDLH Value:** 3,000 ppm  
3.14 **OSHA PEL-TWA:** 200 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 22°F O.C. 20°F C.C.  
4.2 **Flammable Limits in Air:** 1.8%-11.5%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 961°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 4.1 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):**  $\text{N}_2$  diluent: 11.0-11.4%;  $\text{CO}_2$  diluent: 13.5%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 5640 mg/l/48 hr/bluegill/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 214%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.5+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** U159/D035  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 72.11  
9.3 **Boiling Point at 1 atm:** 175.3°F = 79.6°C = 352.8°K  
9.4 **Freezing Point:** -123.3°F = -86.3°C = 186.9°K  
9.5 **Critical Temperature:** 504.5°F = 262.5°C = 535.7°K  
9.6 **Critical Pressure:** 603 psia = 41.0 atm = 4.15 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.806 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.075  
9.12 **Latent Heat of Vaporization:** 191 Btu/lb = 106 cal/g = 4.44 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -13,480 Btu/lb = -7491 cal/g = -313.6 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 3.5 psia

### NOTES

# METHYL ETHYL KETONE

MEK

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	51.460	-35	0.501	10	1.073		N O T  P E R T I N E N T
40	51.280	-30	0.502	15	1.068		
45	51.110	-25	0.503	20	1.063		
50	50.940	-20	0.504	25	1.058		
55	50.760	-15	0.505	30	1.053		
60	50.590	-10	0.507	35	1.048		
65	50.420	-5	0.508	40	1.043		
70	50.240	0	0.509	45	1.038		
75	50.070	5	0.510	50	1.033		
80	49.900	10	0.511	55	1.028		
85	49.720	15	0.512	60	1.023		
90	49.550	20	0.513	65	1.018		
95	49.380	25	0.514	70	1.013		
100	49.200	30	0.516	75	1.008		
105	49.030	35	0.517	80	1.003		
110	48.860	40	0.518	85	0.998		
115	48.680	45	0.519	90	0.993		
120	48.510	50	0.520	95	0.988		
		55	0.521	100	0.983		
		60	0.522	105	0.978		
		65	0.523				
		70	0.524				
		75	0.526				
		80	0.527				
		85	0.528				
		90	0.529				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	27.000	0	0.148	0	0.00216	0	0.352
		10	0.216	10	0.00310	25	0.368
		20	0.310	20	0.00435	50	0.384
		30	0.437	30	0.00599	75	0.399
		40	0.604	40	0.00812	100	0.414
		50	0.823	50	0.01085	125	0.429
		60	1.104	60	0.01427	150	0.444
		70	1.461	70	0.01853	175	0.458
		80	1.909	80	0.02376	200	0.472
		90	2.465	90	0.03012	225	0.486
		100	3.147	100	0.03778	250	0.500
		110	3.977	110	0.04690	275	0.513
		120	4.977	120	0.05768	300	0.526
		130	6.171	130	0.07030	325	0.538
		140	7.586	140	0.08498	350	0.551
		150	9.250	150	0.10190	375	0.563
		160	11.190	160	0.12130	400	0.575
		170	13.450	170	0.14350	425	0.586
		180	16.050	180	0.16850	450	0.598
		190	19.030	190	0.19670	475	0.609
		200	22.420	200	0.22830	500	0.620
		210	26.270	210	0.26350	525	0.630
		220	30.610	220	0.30250	550	0.640
		230	35.480	230	0.34560	575	0.650
		240	40.930	240	0.39290	600	0.660

# 2-METHYL-6-ETHYL ANILINE

MEN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 6-Ethyl-2-methylaniline 6-Ethyl-o-toluidine 2-Methyl-6-ethylbenzenamine	Liquid Clear Pungent odor  Floats on water
Keep people away. Avoid contact with liquid and vapor. Wear chemical safety goggles/face shield, protective gloves, organic vapor canister mask. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Combustion produces poisonous gases. Wear rubber overclothing, boots, gloves, safety goggles, and self- contained breathing apparatus. Extinguish with water, dry chemical, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID A severe eye irritant. IF IN EYES, hold eyelids open and flush with running water for at least 15 minutes. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Contain  
 Collection Systems: Skim; Pump;  
 Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 9; Aromatic amines  
 2.2 **Formula:** CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>NHC<sub>2</sub>H<sub>5</sub>  
 2.3 **IMO/UN Designation:** Not listed  
 2.4 **DOT ID No.:** Not listed  
 2.5 **CAS Registry No.:** 24549-06-2  
 2.6 **NAERG Guide No.:** Not listed  
 2.7 **Standard Industrial Trade Classification:** 51454

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical goggles - face shield, protective gloves, organic vapor canister mask.  
 3.2 **Symptoms Following Exposure:** Inhalation causes weakness, reduction in respiratory rate, coma, gradual respiratory failure, and mild cyanosis (high concentrations). Causes severe irritation of the eyes. Ingestion may produce cyanosis.  
 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air; call a physician. EYES: Flush eyes with plenty of running water for at least 15 minutes. Call a physician. SKIN: Wash thoroughly with soap and water. Flush with running water for at least 15 minutes. INGESTION: If victim is conscious, have victim drink water or milk and induce vomiting.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 1.18 g/kg (rat)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 232°F O.C. 215°F C.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Contain poisonous oxides of nitrogen and carbon dioxide.  
 4.6 **Behavior in Fire:** Produces poisonous gases.  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 63.1 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 16.5 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** Currently not available  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** Currently not available  
 6.5 **GESAMP Hazard Profile:**  
   Bioaccumulation: 0  
   Damage to living resources: 2  
   Human Oral hazard: 1  
   Human Contact hazard: II  
   Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** Currently not available  
 7.4 **Venting:** Currently not available  
 7.5 **IMO Pollution Category:** C  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 135.2  
 9.3 **Boiling Point at 1 atm:** 447.8°F = 231°C = 504°K  
 9.4 **Freezing Point:** -27.4°F = -33°C = 240°K  
 9.5 **Critical Temperature:** Currently not available  
 9.6 **Critical Pressure:** Currently not available  
 9.7 **Specific Gravity:** 0.969 at 20°C  
 9.8 **Liquid Surface Tension:** Currently not available  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
 9.12 **Latent Heat of Vaporization:** Currently not available  
 9.13 **Heat of Combustion:** Currently not available  
 9.14 **Heat of Decomposition:** Currently not available  
 9.15 **Heat of Solution:** Currently not available  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2-METHYL-6-ETHYL ANILINE

MEN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	68	4.000

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.220		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# METHYLETHYLPYRIDINE

MEP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aldehyde-collidine Aldehydine 5-Ethyl-2-methyl pyridine 5-Ethyl-2-picoline MEP	Liquid  Colorless  Sharp odor  Floats on water.
Keep people away. Avoid contact with liquid. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 9; Aromatic amine  
2.2 Formula: C<sub>8</sub>H<sub>9</sub>N  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2300  
2.5 CAS Registry No.: 104-90-5  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51577

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask for high vapor concentrations; plastic gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Breathing of vapors will cause vomiting and chest discomfort. Contact with liquid causes skin and eye burns.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give oxygen if breathing is difficult; call a physician. SKIN OR EYES: immediately flush with plenty of water for at least 15 min.; get medical care for eyes.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 155°F O.C.  
4.2 **Flammable Limits in Air:** 1.1%-6.6%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 939°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 55.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 14.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, neutralize with dilute acetic acid  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** (theor.): 4.4%, 5 days; 56.6%, 20 days; 0.12-2.14 lb/lb, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.9%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** (B)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0
Special (White).....	

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 121.18  
9.3 **Boiling Point at 1 atm:** 352°F = 178°C = 451°K  
9.4 **Freezing Point:** -94.5°F = -70.3°C = 202.9°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.922 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 36 dynes/cm = 0.036 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.1 psia

### NOTES

# METHYLETHYLPYRIDINE

MEP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	58.110	85	0.435	50	1.040	50	2.520
54	58.040	90	0.438	52	1.040	52	2.448
56	57.970	95	0.441	54	1.040	54	2.379
58	57.900	100	0.444	56	1.040	56	2.312
60	57.830	105	0.446	58	1.040	58	2.247
62	57.760	110	0.449	60	1.040	60	2.185
64	57.690	115	0.452	62	1.040	62	2.125
66	57.620	120	0.455	64	1.040	64	2.067
68	57.550	125	0.458	66	1.040	66	2.011
70	57.480	130	0.460	68	1.040	68	1.957
72	57.420	135	0.463	70	1.040	70	1.905
74	57.350	140	0.466	72	1.040	72	1.854
76	57.280	145	0.469	74	1.040	74	1.806
78	57.210	150	0.471	76	1.040	76	1.758
80	57.140			78	1.040	78	1.713
82	57.070			80	1.040	80	1.669
84	57.000			82	1.040	82	1.626
86	56.930			84	1.040	84	1.585
				86	1.040	86	1.545
				88	1.040	88	1.506
				90	1.040	90	1.469
				92	1.040	92	1.433
				94	1.040	94	1.398
				96	1.040	96	1.364
				98	1.040	98	1.331
				100	1.040	100	1.299

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.200	90	0.078	90	0.00161		N
		100	0.105	100	0.00211		O
		110	0.138	110	0.00274		T
		120	0.181	120	0.00353		
		130	0.235	130	0.00450		P
		140	0.303	140	0.00570		E
		150	0.386	150	0.00715		R
		160	0.489	160	0.00890		T
		170	0.614	170	0.01101		I
		180	0.766	180	0.01352		N
		190	0.950	190	0.01650		E
		200	1.169	200	0.02001		N
		210	1.430	210	0.02411		T
		220	1.740	220	0.02890		
		230	2.104	230	0.03444		
		240	2.531	240	0.04083		
		250	3.028	250	0.04817		
		260	3.606	260	0.05656		
		270	4.272	270	0.06610		
		280	5.039	280	0.07691		
		290	5.918	290	0.08911		
		300	6.920	300	0.10280		
		310	8.060	310	0.11820		
		320	9.350	320	0.13540		
		330	10.810	330	0.15450		
		340	12.440	340	0.17570		



# METHYL SALICYLATE

MES

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> o-Anisic acid Benzoic acid, 2-methoxy- Betula or gaultheria oil o-Methoxybenzoic acid Sweet birch oil Teaberry or wintergreen oil	Liquid	Colorless, yellowish or reddish	Wintergreen
<b>Keep people away. Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.</b>			
<b>Fire</b>	Wear self contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> .		
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPORS Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin, eyes, nose, and throat. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters
- 2.2 Formula: 2-(HO)C<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>CH<sub>3</sub>
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 119-36-8
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51393

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self contained breathing apparatus, rubber boots, and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** Harmful if swallowed, inhaled, absorbed through skin. Vapor mist is irritating to the eyes, mucous membranes, upper respiratory tract and skin. Ingestion of relatively small amount causes severe poisoning and death. Causes nausea, vomiting, acidosis, pulmonary edema, pneumonia, convulsions and death.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove to fresh air. If breathing has stopped give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with copious amounts of water for at least 15 minutes, while removing clothing and shoes.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 101 mg/kg man
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors/mist cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** >230°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Emits toxic fumes under fire conditions.
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** 847°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Cautics:** Not pertinent
- 5.5 **Polymerization:** Will not occur
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: (T)  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99 +%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** (B)
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.
- 8.2 49 CFR Class: Not pertinent.
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 152.15
- 9.3 **Boiling Point at 1 atm:** 431.6°F = 222°C = 495.2°K
- 9.4 **Freezing Point:** 17.6-19.4°F = -8 to -7°C = 265.2-266.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.174
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 5.25
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** <0.01 psia

### NOTES

# METHYL SALICYLATE

MES

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.067	129 179 204 230 259 278 302 343 388 434	0.019 0.097 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.231 0.241 0.251 0.261 0.271 0.280 0.289 0.298 0.307 0.316 0.325 0.333 0.341 0.350 0.358 0.366 0.373 0.381 0.389 0.396 0.403 0.410 0.417 0.424 0.431

# METHACRYLONITRILE

MET

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Cyanopropene-1 Isopropene cyanide Isopropenylnitrile 2-Propenenitrile, 2-methyl RCRA waste number U152 USAF ST40	Liquid	Colorless
<b>Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Evacuate area. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.</b>		
<b>Fire</b>	FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective on fire. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from safe distance or protected location. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache or nausea. Move to fresh air. If breathing has stopped, give artificial respiration If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes Harmful if swallowed. Remove contaminated clothing and shoes Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 15; Substituted allyls
- 2.2 **Formula:** H<sub>2</sub>C=C(CH<sub>3</sub>)CN
- 2.3 **IMO/UN Designation:** Currently not available
- 2.4 **DOT ID No.:** Not listed
- 2.5 **CAS Registry No.:** 126-98-7
- 2.6 **NAERG Guide No.:** Not listed.
- 2.7 **Standard Industrial Trade Classification:** 51484

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self contained breathing apparatus, rubber boots and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** May be fatal if inhaled, swallowed or absorbed through skin. Causes severe irritation. High concentrations are extremely destructive to tissues of mucous membranes and upper respiratory tract, eyes and skin. Symptoms of exposure may include burning sensation, coughing, headache, nausea and vomiting. May cause cyanosis (blue-gray coloring of the skin and lips caused by lack of oxygen).
- 3.3 **Treatment of Exposure:** INHALATION: Call a physician. Remove the victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Immediately flush with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes. Ensure adequate flushing of the eyes by holding the eyelids open with the fingers.
- 3.4 **TLV-TWA:** 1 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> = 16mg/kg (rabbit)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 54°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water spray, carbon dioxide, dry chemical, alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Vapor may travel considerable distance to a source of ignition and flash back. Container explosion may occur under fire conditions. Emits toxic fumes under fire conditions.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 29.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Auto polymerization can occur.
- 5.6 **Inhibitor of Polymerization:** Stabilized with 50 ppm Hydroquinone monomethyl ether.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** U152
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** liquid
- 9.2 **Molecular Weight:** 67.09
- 9.3 **Boiling Point at 1 atm:** 194-197.6°F = 90-92°C = 365.2-365.2°C
- 9.4 **Freezing Point:** -32.4°F = -35.8°C = 237.4°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.800
- 9.8 **Liquid Surface Tension:** 24.45 dynes/cm = 0.024 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 2.31
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 2.449 psia

### NOTES

# METHACRYLONITRILE

MET

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	68	0.392

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68 122	2.570 2.690	-48 -10 10 31 55 68 91 122 131 159 195	0.019 0.097 0.193 0.387 0.774 1.238 1.934 3.807 4.390 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.289 0.299 0.309 0.319 0.328 0.338 0.347 0.356 0.365 0.374 0.383 0.391 0.400 0.408 0.416 0.424 0.431 0.439 0.446 0.454 0.461 0.468 0.474 0.481 0.487

# LEAD ALKYL

MFA

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Oily liquid

Dyed red, orange or blue

Sweet fruity odor

Sinks in water.

Evacuate.  
Restrict human use; farm use; industrial use.  
Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR.  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  
Call fire department.  
Stay upwind and use water spray to "knock down" vapor.  
Notify local health and pollution control agencies.

### Fire

Combustible.  
POISONOUS GASES ARE PRODUCED IN FIRE.  
Container may explode when heated.  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  
Combat fires form behind barrier or protected location.  
Flood discharge area with water.  
Extinguish with water, dry chemical, foam or carbon dioxide.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.

LIQUID  
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.  
Will burn eyes.  
Remove contaminated clothes and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 0; Unassigned cargoes  
2.2 Formula: Not listed  
2.3 IMO/UN Designation: 6.1/1649  
2.4 DOT ID No.: 1649  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 131  
2.7 Standard Industrial Trade Classification: 59721

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor cartridge-type face mask for emergency or short duration; fresh air mask for longer duration; impervious protective gloves; goggles as required; boots and light-colored clothing.
- 3.2 **Symptoms Following Exposure:** Increased urinary output of lead. Large degree of absorption from inhalation or skin contact may cause insomnia, excitability, delirium, coma and death.
- 3.3 **Treatment of Exposure:** Call a physician for any exposure. INHALATION: remove from exposure. INGESTION: no specific antidote. EYES: flush with plenty of water for about 15 min. SKIN: flush with kerosene, wash with soap and water.
- 3.4 **TLV-TWA:** 0.15 mg/m<sup>3</sup> (as lead, based on tetraethyl and tetramethyl lead).
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Lead poisoning
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. Toxic absorption through skin may occur.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 40 mg/m<sup>3</sup> (as lead, based on tetraethyl and tetramethyl lead).
- 3.14 **OSHA PEL-TWA:** 0.075 mg/m<sup>3</sup> (as lead, based on tetraethyl and tetramethyl lead).
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 89°F–265°F O.C.
- 4.2 **Flammable Limits in Air:** None established
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic lead-containing gases are generated in fires.
- 4.6 **Behavior in Fire:** Containers may explode
- 4.7 **Auto Ignition Temperature:** Begins to decompose above 212°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Reacts with oxidizing materials, active metals and rust, but not considered hazardous.
- 5.3 **Stability During Transport:** A self-sustaining decomposition occurs if the temperature of the bulk liquid is above 212°F and a flame or hot metal surface serves to ignite the mass. The presence of ethylene dibromide makes the compound stable at 300°F for 15 hrs.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** See Tetraethyl Lead
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 50-60% mixed lead alkyls 18-36% ethylene dibromide 0-19% ethylene dichloride 2-12% toluene, other solvents, dyes.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** A
- 7.6 **Ship Type:** 1
- 7.7 **Barge Hull Type:** 1

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** >200°F = >93°C = >367°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.5-1.7 at 15°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 45 dynes/cm = 0.045 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.030
- 9.12 **Latent Heat of Vaporization:** (est.) 101 Btu/lb = 56.2 cal/g = 2.35 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** (est.) –18,200 Btu/lb = –10,100 cal/g = –424 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.2 to 1.7 psia

## NOTES

# LEAD ALKYLs

MFA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	93.629	50	0.478	50	1.040	50	9.343
52	93.629	52	0.478	52	1.040	52	8.841
54	93.629	54	0.478	54	1.040	54	8.370
56	93.629	56	0.478	56	1.040	56	7.927
58	93.629	58	0.478	58	1.040	58	7.511
60	93.629	60	0.478	60	1.040	60	7.119
62	93.629	62	0.478	62	1.040	62	6.751
64	93.629	64	0.478	64	1.040	64	6.404
66	93.629	66	0.478	66	1.040	66	6.078
68	93.629	68	0.478	68	1.040	68	5.770
70	93.629	70	0.478	70	1.040	70	5.481
72	93.629	72	0.478	72	1.040	72	5.207
74	93.629	74	0.478	74	1.040	74	4.950
76	93.629	76	0.478	76	1.040	76	4.707
78	93.629	78	0.478	78	1.040	78	4.477
80	93.629	80	0.478	80	1.040	80	4.260
82	93.629	82	0.478	82	1.040	82	4.056
84	93.629	84	0.478	84	1.040	84	3.862
86	93.629	86	0.478	86	1.040	86	3.679
88	93.629	88	0.478	88	1.040	88	3.506
90	93.629	90	0.478	90	1.040	90	3.342
92	93.629	92	0.478	92	1.040	92	3.187
94	93.629	94	0.478	94	1.040	94	3.040
96	93.629	96	0.478	96	1.040	96	2.901
98	93.629	98	0.478	98	1.040	98	2.770
100	93.629	100	0.478	100	1.040	100	2.645

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C	90	0.094		N		N
	U	100	0.124		O		O
	R	110	0.163		T		T
	R	120	0.211				
	E	130	0.272		P		P
	N	140	0.347		E		E
	T	150	0.440		R		R
	L	160	0.553		T		T
	Y	170	0.691		I		I
		180	0.856		N		N
	N	190	1.054		E		E
	O	200	1.290		N		N
	T	210	1.569		T		T
		220	1.897				
	A	230	2.281				
	V	240	2.728				
	A	250	3.247				
	I	260	3.846				
	L	270	4.535				
	A	280	5.323				
	B	290	6.221				
	L	300	7.241				
	E	310	8.394				
		320	9.695				
		330	11.160				
		340	12.790				

# METHYL FORMATE

**MFM**

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Formic acid, methyl ester	Liquid  Colorless  Pleasant odor  Mixes with water. Flammable, irritating vapor is produced. Boiling point is 88°F.
Evacuate. Keep people away. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: HCOOCH3
- 2.3 IMO/UN Designation: 3.1/1243
- 2.4 DOT ID No.: 1243
- 2.5 CAS Registry No.: 107-31-3
- 2.6 NAERG Guide No.: 129
- 2.7 Standard Industrial Trade Classification: 51374

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or safety glasses; self-contained breathing apparatus; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membranes. Prolonged inhalation can produce narcosis and central nervous symptoms, including some temporary visual disturbance. Contact with liquid irritates eyes and may irritate skin if allowed to remain. Ingestion causes irritation of mouth and stomach and central nervous system depression, including visual disturbances.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air and rest; if pulmonary edema develops, administer oxygen; call physician. EYES: irrigate with water for 15 min. SKIN: wash thoroughly with soap and water. INGESTION: do NOT induce vomiting; get medical attention.
- 3.4 TLV-TWA: 100 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: 150 ppm.
- 3.7 Toxicity by Ingestion: Grade 1; LD<sub>50</sub> = 5 to 15 g/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: 4,500 ppm
- 3.14 OSHA PEL-TWA: 100 ppm
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: -26°F C.C.
- 4.2 Flammable Limits in Air: 5%-22.7%
- 4.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
- 4.7 Auto Ignition Temperature: 853°F
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: 2.5 mm/min.
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 9.5 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 4.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): N<sub>2</sub> diluent: 10.0-10.1%; CO<sub>2</sub> diluent: 12.5%

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Slow reaction to form formic acid and methyl alcohol; reaction is not hazardous.
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical, practical, and spectro grades: all 97.5+%
- 7.2 Storage Temperature: <85°F
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Pressure-vacuum
- 7.5 IMO Pollution Category: D
- 7.6 Ship Type: 2
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid
- 8.2 49 CFR Class: 3
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 60.1
- 9.3 Boiling Point at 1 atm: 89.2°F = 31.8°C = 305°K
- 9.4 Freezing Point: -147.6°F = -99.8°C = 173.4°K
- 9.5 Critical Temperature: 417.2°F = 214°C = 487.2°K
- 9.6 Critical Pressure: 870 psia = 59.2 atm = 6.00 MN/m<sup>2</sup>
- 9.7 Specific Gravity: 0.977 at 20°C (liquid)
- 9.8 Liquid Surface Tension: 25 dynes/cm = 0.025 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: 2.07
- 9.11 Ratio of Specific Heats of Vapor (Gas): 1.1446
- 9.12 Latent Heat of Vaporization: 202 Btu/lb = 112 cal/g = 4.69 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: -6,980 Btu/lb = -3,880 cal/g = -162 X 10<sup>5</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# METHYL FORMATE

MFH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	62.330	34	0.515	28	1.352	35	0.427
36	62.230	36	0.515	30	1.349	40	0.415
38	62.130	38	0.515	32	1.346	45	0.403
40	62.030	40	0.515	34	1.343	50	0.392
42	61.940	42	0.515	36	1.340	55	0.381
44	61.840	44	0.515	38	1.337	60	0.371
46	61.740	46	0.515	40	1.334	65	0.361
48	61.650	48	0.515	42	1.331	70	0.352
50	61.550	50	0.515	44	1.328	75	0.343
52	61.450	52	0.515	46	1.325	80	0.335
54	61.350	54	0.515	48	1.322	85	0.327
56	61.260	56	0.515	50	1.319		
58	61.160	58	0.515	52	1.316		
60	61.060	60	0.515	54	1.312		
62	60.970	62	0.515	56	1.309		
64	60.870	64	0.515	58	1.306		
66	60.770	66	0.515	60	1.303		
68	60.670	68	0.515	62	1.300		
70	60.580	70	0.515	64	1.297		
72	60.480	72	0.515	66	1.294		
74	60.380	74	0.515	68	1.291		
76	60.290	76	0.515	70	1.288		
78	60.190	78	0.515	72	1.285		
80	60.090	80	0.515	74	1.282		
82	59.990	82	0.515	76	1.279		
84	59.900	84	0.515	78	1.276		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	30.000	0	1.528	0	0.01861	0	0.237
		5	1.774	5	0.02137	20	0.244
		10	2.053	10	0.02447	40	0.252
		15	2.368	15	0.02793	60	0.259
		20	2.724	20	0.03180	80	0.266
		25	3.125	25	0.03610	100	0.273
		30	3.574	30	0.04087	120	0.280
		35	4.077	35	0.04615	140	0.286
		40	4.639	40	0.05197	160	0.293
		45	5.264	45	0.05840	180	0.299
		50	5.958	50	0.06545	200	0.306
		55	6.729	55	0.07320	220	0.312
		60	7.581	60	0.08167	240	0.318
		65	8.521	65	0.09093	260	0.324
		70	9.557	70	0.10100	280	0.330
		75	10.700	75	0.11200	300	0.336
		80	11.950	80	0.12390	320	0.342
		85	13.310	85	0.13690	340	0.348
		90	14.810	90	0.15090	360	0.353
		95	16.440	95	0.16600	380	0.359
						400	0.364
						420	0.369
						440	0.375
						460	0.380
						480	0.385
						500	0.390



# MAGNESIUM NITRATE

MGN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Magnesium nitrate hexahydrate Nitromagnesite		Solid crystals	White	Odorless
Wear protective gloves and clean body-covering clothing. Notify local health and pollution control agencies.				
<b>Fire</b>	Not flammable. Strong oxidizer which may cause extremely violent combustion of oxidizable materials. Wear full protective clothing and self-contained breathing apparatus. Extinguish with materials appropriate for surrounding fire.			
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash skin with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** Mg(NO<sub>3</sub>)<sub>2</sub>·6H<sub>2</sub>O  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** 1474  
2.5 **CAS Registry No.:** 13446-18-9  
2.6 **NAERG Guide No.:** 140  
2.7 **Standard Industrial Trade Classification:** 52359

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear protective gloves and clean body-covering clothing. If dust is encountered, use approved respirator.  
3.2 **Symptoms Following Exposure:** Exposure can cause mild irritation to the mucous membranes. Symptoms may include coughing and shortness of breath. Ingestion of large doses may cause dizziness, abdominal pain, vomiting, bloody diarrhea, weakness, convulsions, and collapse. Contact with skin may cause irritation, redness, and pain.  
3.3 **Treatment of Exposure:** Get medical attention. **INHALATION:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. **EYES:** Flush with water for at least 15 min., lifting lids occasionally. Contact lenses should not be worn when working with this chemical. **SKIN:** Remove contaminated clothing and shoes. Wash with soap and water. **INGESTION:** Induce vomiting immediately by giving two glasses of water or milk and sticking finger down throat.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available.  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable.  
4.2 **Flammable Limits in Air:** Not pertinent.  
4.3 **Fire Extinguishing Agents:** Use materials appropriate for the surrounding fire.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.  
4.5 **Special Hazards of Combustion Products:** Toxic fumes of nitrogen oxides are produced when heated to decomposition.  
4.6 **Behavior in Fire:** Contact with oxidizable substances may cause extremely violent combustion.  
4.7 **Auto Ignition Temperature:** Not pertinent.  
4.8 **Electrical Hazards:** Not pertinent.  
4.9 **Burning Rate:** Not pertinent.  
4.10 **Adiabatic Flame Temperature:** Not pertinent.  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Not pertinent.  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Contact with dimethyl formamide, combustible, organic, and oxidizable materials can generate heat, perhaps causing ignition and violent combustion.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; 98%.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** None required.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer  
8.2 **49 CFR Class:** 5.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 256.41  
9.3 **Boiling Point at 1 atm:** Decomposes at 626°F = 330°C = 603°K  
9.4 **Freezing Point:** 192°F = 89°C = 362°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.46  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# MAGNESIUM NITRATE

MGN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# MAGNESIUM

MGX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Magnesium perchlorate		Solid	Silvery	Odorless
		Sinks in water.		
Keep people away. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.				
<b>Fire</b>	FLAMMABLE. Extinguish with dry graphite, soda ash, or other inert powder. DO NOT USE WATER, FOAM, CARBON DIOXIDE, DRY CHEMICALS, OR VAPORIZING LIQUID ON FIRE.			
<b>Exposure</b>	Call for medical aid.  SOLID Irritating to eyes. Harmful if swallowed. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Mg  
2.3 IMO/UN Designation: Pellets, turnings, or ribbon: 4.1/1869; powder, non-pyroric: 4.3/1418  
2.4 DOT ID No.: 1418 (powder), 1869 (pellets)  
2.5 CAS Registry No.: 7439-95-4  
2.6 NAERG Guide No.: 138  
2.7 Standard Industrial Trade Classification: 52229

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Eye protection  
3.2 Symptoms Following Exposure: Dust irritates eyes in same way as any foreign material. Penetration of skin by fragments of metal is likely to produce local irritation, blisters, and ulcers which may become infected.  
3.3 Treatment of Exposure: EYES: flush with water to remove dust. SKIN: treat as any puncture.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Oral LD<sub>50/60</sub> (lowest lethal dose) = 230 mg/kg (dog)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent (solid). Flammable when in the form of turnings or powder.  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Inert dry powders (e.g., graphite, limestone, salt)  
4.4 Fire Extinguishing Agents Not to Be Used: Water, foam, halogenated agents, carbon dioxide.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Forms dense white smoke. Flame is very bright.  
4.7 Auto Ignition Temperature: 883°F  
4.8 Electrical Hazards: Class I, Group E  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 4.8 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 1.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: In finely divided form, reacts with water and acids to release flammable hydrogen gas.  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: None  
6.2 Waterfowl Toxicity: None  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Pigs, ingots, turnings, sticks: all high purity.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Dangerous When Wet  
8.2 49 CFR Class: 4.3  
8.3 49 CFR Package Group: Currently not available.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	2

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 24.3  
9.3 Boiling Point at 1 atm: 2,012°F = 1,100°C = 1,373°K  
9.4 Freezing Point: 1,202°F = 650°C = 923°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.74 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: -11,950 Btu/lb = -6,650 cal/g = -278 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 88.9 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# MAGNESIUM

MGX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 2-METHYL-2-HYDROXY-3-BUTYNE

MHB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dimethylacetylenecarbinol Dimethylethynylcarbinol 1,1-Dimethylpropargyl alcohol Methyl butynol 2-Methyl-2-butynol	Liquid  Colorless  Characteristic  Floats and mixes with water. Flammable vapor is produced.
Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE: Vapor may explode if ignited in an enclosed area. Flashback along vapor trail may occur. Extinguish with alcohol foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID. Exposure data not available. Flush affected area with plenty of water.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $(\text{CH}_3)_2(\text{OH})\text{C}\equiv\text{CH}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51219

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Rubber gloves, face shield and laboratory coat. An all purpose canister mask should be available if needed.
- 3.2 Symptoms Following Exposure: Currently not available.
- 3.3 Treatment of Exposure: Currently not available.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 77°F O.C.
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Alcohol foam, mist, spray, CO<sub>2</sub>.
- 4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Can react with oxidizing materials.
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 30.9 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 9.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available
- 7.2 Storage Temperature: Currently not available
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: 3
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 84.11.
- 9.3 Boiling Point at 1 atm: 219.2°F = 104°C = 377.2°K.
- 9.4 Freezing Point: 37.4°F = 3.0°C = 276.2°K.
- 9.5 Critical Temperature: (est.) 553.5°F = 289.7°C = 562.9°K.
- 9.6 Critical Pressure: (est.) 582 psia = 39.6 atm = 4.01 MN/m<sup>2</sup>
- 9.7 Specific Gravity: 0.8618 at 20°C.
- 9.8 Liquid Surface Tension: 23.8 dynes/cm = 0.0238 N/m at 25°C.
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: 2.9.
- 9.11 Ratio of Specific Heats of Vapor (Gas): (est.) Greater than one.
- 9.12 Latent Heat of Vaporization: (est.) 165.6 Btu/lb = 92 cal/g = 3.8 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 0
  - Human Oral hazard: 1
  - Human Contact hazard: 0
  - Reduction of amenities: 0

NOTES

# 2-METHYL-2-HYDROXY-3-BUTYNE

MHB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E	68	0.646		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140	0.125 0.147 0.172 0.201 0.236 0.276 0.323 0.378 0.443 0.519 0.607 0.711 0.833 0.975 1.142 1.338 1.566 1.834 2.148 2.515	45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140	0.00194 0.00225 0.00261 0.00303 0.00352 0.00408 0.00474 0.00550 0.00638 0.00741 0.00859 0.00997 0.01157 0.01343 0.01558 0.01808 0.02098 0.02435 0.02826 0.03279		C U R R E N T L Y  N O T  A V A I L A B L E

# METHYL CHLOROFORMATE

MHC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlorocarbonic acid, methyl ester Chloroformic acid, methyl ester Methyl chlorocarbonate	Liquid  Colorless to light yellow  Unpleasant odor  Sinks and reacts in water. Flammable, irritating vapor is produced.
<b>Evacuate.</b> <b>Keep people away. Avoid contact with liquid and vapor.</b> <b>Shut off ignition sources. Call fire department.</b> <b>Stay upwind. Use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with water, dry chemicals, foam, carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Collection Systems: Pump Chemical and Physical Treatment: Neutralize	<b>2. CHEMICAL DESIGNATIONS</b>  2.1 CG Compatibility Group: Not listed. 2.2 Formula: <chem>CICOOCH3</chem> 2.3 IMO/UN Designation: 3.2/1238 2.4 DOT ID No.: 1238 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: 155 2.7 Standard Industrial Trade Classification: 51374
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Acid- or organic-canister mask or self-contained breathing apparatus; goggles or face shield; plastic gloves 3.2 <b>Symptoms Following Exposure:</b> Inhalation of vapor irritates nose and throat and can cause delayed pulmonary edema. Liquid irritates eyes and causes severe skin burns if allowed to remain. Ingestion causes burns of mouth and stomach. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove victim from exposure; if breathing stops, administer artificial respiration; call physician. EYES: irrigate with copious amounts of water for at least 15 min.; call physician if needed. SKIN: flush with water for 15 min.; get medical attention for burns. INGESTION: give large amounts of water; do NOT induce vomiting; get medical attention. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 4; oral LD <sub>50</sub> <50 mg/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 76°F O.C. 73°F C.C.  
4.2 **Flammable Limits in Air:** LFL = 6.7%  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride and phosgene may be formed.  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 2.0 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 7.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 4.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly, evolving hydrogen chloride (hydrochloric acid). Reaction can be hazardous if water is hot.  
5.2 **Reactivity with Common Materials:** Corrodes rubber  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** U156  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 94.5  
9.3 **Boiling Point at 1 atm:** 160°F = 71°C = 344°K  
9.4 **Freezing Point:** <-114°F = <-81°C = <192°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.22 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.25  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1544  
9.12 **Latent Heat of Vaporization:** (est.) 153 Btu/lb = 85 cal/g = 3.6 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -4,690 Btu/lb = -2,600 cal/g = -109 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# METHYL CHLOROFORMATE

MHC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	77.330	65	0.316	52	1.048	60	7.064
36	77.259	70	0.320	54	1.048	61	6.879
38	77.200	75	0.324	56	1.048	62	6.699
40	77.129	80	0.327	58	1.048	63	6.524
42	77.059	85	0.331	60	1.048	64	6.355
44	76.990	90	0.335	62	1.048	65	6.190
46	76.919	95	0.339	64	1.048	66	6.031
48	76.849	100	0.343	66	1.048	67	5.876
50	76.780	105	0.347	68	1.048	68	5.726
52	76.709	110	0.351	70	1.048	69	5.580
54	76.639	115	0.355	72	1.048	70	5.438
56	76.570	120	0.359	74	1.048	71	5.301
58	76.500	125	0.362	76	1.048	72	5.167
60	76.429	130	0.366	78	1.048	73	5.037
62	76.360			80	1.048	74	4.911
64	76.290			82	1.048	75	4.789
66	76.219			84	1.048	76	4.670
68	76.150			86	1.048	77	4.555
70	76.089						
72	76.020						
74	75.950						
76	75.879						
78	75.809						
80	75.740						
82	75.669						
84	75.599						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C	141	10.230	141	0.14990	0	0.148
	U	142	10.440	142	0.15270	25	0.151
	R	143	10.650	143	0.15550	50	0.155
	R	144	10.860	144	0.15840	75	0.158
	E	145	11.080	145	0.16140	100	0.161
	N	146	11.310	146	0.16430	125	0.164
	T	147	11.530	147	0.16740	150	0.168
	L	148	11.760	148	0.17040	175	0.170
	Y	149	12.000	149	0.17350	200	0.173
		150	12.240	150	0.17670	225	0.176
	N	151	12.480	151	0.17990	250	0.179
	O	152	12.730	152	0.18320	275	0.181
	T	153	12.980	153	0.18650	300	0.184
		154	13.230	154	0.18980	325	0.186
	A	155	13.490	155	0.19320	350	0.188
	V	156	13.750	156	0.19660	375	0.190
	A	157	14.020	157	0.20010	400	0.192
	I	158	14.290	158	0.20370	425	0.194
	L	159	14.570	159	0.20730	450	0.196
	A	160	14.850	160	0.21090	475	0.198
	B	161	15.130	161	0.21460	500	0.199
	L	162	15.420	162	0.21840	525	0.201
	E	163	15.710	163	0.22220	550	0.202
		164	16.010	164	0.22600	575	0.203
		165	16.310	165	0.22990	600	0.204
		166	16.620	166	0.23390		



# METHYL HEPTYL KETONE

MHK

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ketone, heptyl methyl Nonan-2-one 2-Nonanone	Liquid  Colorless
<b>Keep people away.</b> <b>Shut off ignition sources.</b> <b>Call fire department.</b> <b>Stay upwind. Use water spray to "knock down" vapor.</b> <b>Avoid contact with liquid or vapor.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. Wear self-contained breathing apparatus and protective clothing. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling shoreline. May be dangerous if it enter water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 18; Ketones  
2.2 Formula: CH<sub>3</sub>(CH<sub>2</sub>)<sub>6</sub>COCH<sub>3</sub>  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 821-55-6  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots and heavy rubber gloves.  
3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion, or skin absorption. May cause eye and skin irritation.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. If not breathing give artificial respiration. If breathing is difficult give oxygen. SKIN: Wash with soap and copious amounts of water. EYES: Flush with copious amounts of water for at least 15 minutes.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 3.2 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 148°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray, carbon dioxide, dry chemical, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 61.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Will not occur  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 142.24  
9.3 **Boiling Point at 1 atm:** 377.6°F = 192°C = 465.2°K (at 743 mmHg = .97 atm)  
9.4 **Freezing Point:** -5.8°F = -21 °C = 252.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.832  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.9  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.0309 psia

### NOTES

# METHYL HEPTYL KETONE

MHK

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	90 138 162 189 218 237 261 299 340 383	0.019 0.097 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.331 0.345 0.358 372.000 0.385 0.398 0.410 0.423 0.435 0.447 0.459 0.470 0.481 0.493 0.503 0.514 0.525 0.535 0.545 0.555 0.565 0.574 0.584 0.593 0.602

# 2-METHYLCYCLOHEXANOL

MHX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hexahydrocresols	Liquid  Straw colored  Weak coconut oil odor  Floats on water.
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with alcohol foam, dry chemical, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, give large quantity of water. After swallowing water, induce vomiting.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_8H_{16}(OH)(CH_3)$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: 2617  
2.5 CAS Registry No.: 583-59-5  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51231

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Impervious clothing and gloves should be used to prevent skin contact. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** May cause headache and irritation of the eyes, nose and throat. Prolonged or repeated contact may cause a skin rash.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. Contact lenses should not be worn when working with this chemical. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. INGESTION: Give the victim large quantity of water. After swallowing the water, induce vomiting.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; oral rat  $LD_{50}$  = 2.0 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Repeated or prolonged overexposure may cause a skin rash. In animals it has caused drowsiness, unconsciousness, and mild liver and kidney damage.  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 Odor Threshold: 500 ppm.  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 138°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide.  
4.4 Fire Extinguishing Agents Not to Be Used: Water.  
4.5 Special Hazards of Combustion Products: Irritating vapors and toxic gases, such as carbon monoxide, may be formed when involved in fire.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 565°F.  
4.8 Electrical Hazards: Not listed.  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 47.6 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 14.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.  
5.2 Reactivity with Common Materials: Contact with strong oxidizers may cause fires and explosions.  
5.3 Stability During Transport: Stable.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.  
5.5 Polymerization: Will not polymerize.  
5.6 Inhibitor of Polymerization: Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical grades.  
7.2 Storage Temperature: Ambient.  
7.3 Inert Atmosphere: No requirement.  
7.4 Venting: Not listed.  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	-
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 114.2  
9.3 Boiling Point at 1 atm: 325.4 - 330.8°F = 163 - 166°C = 436 - 439°K  
9.4 Freezing Point: <-6°F = <-21°C = <252°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 0.93  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 3.9  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent.  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# 2-METHYLCYCLOHEXANOL

MHX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# METHYLHYDRAZINE

MHZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> MMH Monomethylhydrazine	Liquid  Colorless  Ammonia-like odor  Mixes with water. Poisonous, flammable vapor is produced.
Evacuate. <b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles and self-contained breathing apparatus. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. May explode if exposed to heat or flames. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{NHNH}_2$   
2.3 IMO/UN Designation: 3.2/1244  
2.4 DOT ID No.: 1244  
2.5 CAS Registry No.: 60-34-4  
2.6 NAERG Guide No.: 131  
2.7 Standard Industrial Trade Classification: 51486

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister mask or self-contained breathing apparatus; goggles or face shield; rubber gloves; protective clothing
- 3.2 **Symptoms Following Exposure:** Tremors and convulsions follow absorption by any route. Inhalation causes local irritation of respiratory tract, respiratory distress, and systemic effects. Contact of liquid with eyes or skin causes irritation and burns. Ingestion causes irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention at once following all exposures to this compound.  
INHALATION: move victim to fresh air and keep him quiet; give artificial respiration if breathing stops. EYES: flush for at least 15 min. with large quantities of water. SKIN: immediately wash with large quantities of water and treat as for alkali burn. INGESTION: give egg whites or other emollient, followed by a 5% salt solution or other mild emetic. Keep patient as quiet as possible. To control convulsions, short-acting barbituates may be administered parenterally by a physician with due regard for depression of respiration.
- 3.4 TLV-TWA: 0.01 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 4; oral  $\text{LD}_{50} = 33 \text{ mg/kg}$  (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Hemolytic anemia may result from large doses by any route.  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
3.12 Odor Threshold: 1-3 ppm  
3.13 IDLH Value: 20 ppm  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: 0.2 ppm  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 62°F O.C.  
4.2 Flammable Limits in Air: 2.5%-98%  
4.3 Fire Extinguishing Agents: Water or dry chemical  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Irritating nitrogen oxides are produced.  
4.6 Behavior in Fire: May explode  
4.7 Auto Ignition Temperature: 382°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: 2.0 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 20.2 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 5.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Reacts slowly with air, but heat may cause ignition of rags, rust, or other combustibles.  
5.3 Stability During Transport: Stable if not in contact with iron, copper, or their alloys.  
5.4 Neutralizing Agents for Acids and Caustics: Flush with water  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Propellant grade, 99+%; Laboratory grade, 98+%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Padded with nitrogen  
7.4 Venting: Safety relief  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	1

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: P068  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 46.1  
9.3 Boiling Point at 1 atm: 189.5°F = 87.5°C = 360.7°K  
9.4 Freezing Point: -62.3°F = -52.4°C = 220.8°K  
9.5 Critical Temperature: 593.6°F = 312°C = 585.2°K  
9.6 Critical Pressure: 1,195 psia = 81.3 atm = 8.25 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.878 at 20°C (liquid)  
9.8 Liquid Surface Tension: 34.3 dynes/cm = 0.0343 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 1.59  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.1326  
9.12 Latent Heat of Vaporization: 376 Btu/lb = 209 cal/g = 8.75 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -12,178 Btu/lb = -6,766 cal/g = -283.1 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# METHYLHYDRAZINE

MHZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	55.950	0	0.689	0	1.811	0	2.031
40	55.780	5	0.689	5	1.805	5	1.891
45	55.600	10	0.690	10	1.799	10	1.764
50	55.430	15	0.691	15	1.794	15	1.648
55	55.260	20	0.692	20	1.788	20	1.541
60	55.080	25	0.693	25	1.782	25	1.443
65	54.910	30	0.694	30	1.776	30	1.354
70	54.740	35	0.694	35	1.770	35	1.271
75	54.560	40	0.695	40	1.764	40	1.195
80	54.390	45	0.696	45	1.759	45	1.125
85	54.220	50	0.697	50	1.753	50	1.060
90	54.040	55	0.698	55	1.747	55	1.001
95	53.870	60	0.699	60	1.741	60	0.945
100	53.700	65	0.699	65	1.735	65	0.894
		70	0.700	70	1.729	70	0.846
		75	0.701	75	1.724	75	0.802
		80	0.702	80	1.718	80	0.761
		85	0.703	85	1.712	85	0.722
		90	0.704	90	1.706	90	0.686
		95	0.704	95	1.700	95	0.653
		100	0.705	100	1.695	100	0.622
				105	1.689		
				110	1.683		
				115	1.677		
				120	1.671		
				125	1.665		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	55	0.483	55	0.00403	0	0.340
	I	60	0.566	60	0.00467	20	0.348
	S	65	0.661	65	0.00541	40	0.356
	C	70	0.769	70	0.00624	60	0.365
	I	75	0.893	75	0.00717	80	0.373
	B	80	1.034	80	0.00823	100	0.381
	L	85	1.194	85	0.00942	120	0.390
	E	90	1.376	90	0.01075	140	0.398
		95	1.581	95	0.01224	160	0.406
		100	1.812	100	0.01390	180	0.414
		105	2.071	105	0.01575	200	0.423
		110	2.362	110	0.01781	220	0.431
		115	2.688	115	0.02009	240	0.439
		120	3.052	120	0.02261	260	0.448
		125	3.458	125	0.02540	280	0.456
		130	3.910	130	0.02848	300	0.464
		135	4.411	135	0.03186	320	0.473
		140	4.967	140	0.03557	340	0.481
		145	5.582	145	0.03964	360	0.489
		150	6.261	150	0.04410	380	0.498
		155	7.009	155	0.04897	400	0.506
		160	7.833	160	0.05428	420	0.514
		165	8.737	165	0.06007	440	0.523
		170	9.730	170	0.06636		
		175	10.820	175	0.07319		
		180	12.000	180	0.08060		

# METHYL ISOBUTYL CARBINOL

MIC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isobutylmethylcarbinol MAA MAOH Methyl amyl alcohol 4-Methyl-2-pentanol MIBC MIC	Oily liquid  Colorless  Mild alcohol odor  Floats on water. Irritating vapor is produced.
Notify local health and pollution control agencies. Keep people away. Avoid contact with liquid and vapor. Call fire department.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if skin is exposed. If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $(CH_3)_2CHCH_2CH(OH)CH_3$   
2.3 IMO/UN Designation: 3.3/2053  
2.4 DOT ID No.: 2053  
2.5 CAS Registry No.: 105-30-6  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air pack or organic canister mask; rubber gloves; goggles or face shield  
3.2 **Symptoms Following Exposure:** Vapor irritates eyes and nose; may cause anesthesia. Prolonged contact with liquid causes irritation and cracking of skin; also irritates eyes.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; give artificial respiration if needed; call a doctor. SKIN: flush with water. EYES: flush with water for at least 15 min; consult a doctor.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5$  to  $5$  g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 120-130°F O.C.; 106°F C.C.  
4.2 **Flammable Limits in Air:** 1.0%-5.5%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 370 ppm/24 hr/brine shrimp/TL<sub>m</sub>  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 50% of theoretical in 5 days, freshwater  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0
Special (White).....	

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCL List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 102.18  
9.3 **Boiling Point at 1 atm:** 269.2°F = 131.8°C = 405°K  
9.4 **Freezing Point:** <-130°F = <-90°C = <183°K  
9.5 **Critical Temperature:** 555.8°F = 291°C = 564.2°K  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.807 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 22.8 dynes/cm = 0.0228 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.053  
9.12 **Latent Heat of Vaporization:** 162 Btu/lb = 90.1 cal/g =  $3.77 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** (est.) -16,600 Btu/lb = -9,300 cal/g =  $-387 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL ISOBUTYL CARBINOL

MIC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	51.690	34	0.501	42	1.109	N O T  P E R T I N E N T	
40	51.480	36	0.502	44	1.109		
45	51.270	38	0.503	46	1.109		
50	51.060	40	0.504	48	1.109		
55	50.850	42	0.505	50	1.109		
60	50.650	44	0.507	52	1.109		
65	50.440	46	0.508	54	1.109		
70	50.230	48	0.509	56	1.109		
75	50.020	50	0.510	58	1.109		
80	49.810	52	0.511	60	1.109		
85	49.610	54	0.512	62	1.109		
90	49.400	56	0.513	64	1.109		
95	49.190	58	0.514	66	1.109		
100	48.980	60	0.515	68	1.109		
105	48.770	62	0.517	70	1.109		
110	48.570	64	0.518	72	1.109		
115	48.360	66	0.519	74	1.109		
120	48.150	68	0.520	76	1.109		
125	47.940	70	0.521	78	1.109		
130	47.730	72	0.522	80	1.109		
135	47.520	74	0.523	82	1.109		
140	47.320	76	0.524	84	1.109		
		78	0.525				
		80	0.527				
		82	0.528				
		84	0.529				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.600	60	0.073	60	0.00133	0	0.347
		70	0.103	70	0.00186	25	0.362
		80	0.145	80	0.00255	50	0.377
		90	0.200	90	0.00347	75	0.391
		100	0.274	100	0.00467	100	0.405
		110	0.371	110	0.00620	125	0.420
		120	0.497	120	0.00816	150	0.433
		130	0.659	130	0.01063	175	0.447
		140	0.864	140	0.01372	200	0.460
		150	1.124	150	0.01756	225	0.473
		160	1.450	160	0.02227	250	0.486
		170	1.854	170	0.02803	275	0.499
		180	2.353	180	0.03502	300	0.511
		190	2.964	190	0.04343	325	0.523
		200	3.707	200	0.05349	350	0.535
		210	4.605	210	0.06545	375	0.547
		220	5.682	220	0.07958	400	0.558
		230	6.969	230	0.09619	425	0.569
		240	8.497	240	0.11560	450	0.580
		250	10.300	250	0.13820	475	0.591
		260	12.420	260	0.16430	500	0.602
		270	14.900	270	0.19440	525	0.612
		280	17.780	280	0.22880	550	0.622
		290	21.120	290	0.26820	575	0.632
		300	24.970	300	0.31290	600	0.642



# MERCURIC IODIDE

MID

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Mercuric iodide, red Mercury biniodide	Solid  Red  Odorless  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear dust respirator and rubber overclothing (including gloves). Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: Hgl<sub>2</sub>
- 2.3 IMO/UN Designation: 6.1/1638
- 2.4 DOT ID No.: 1638
- 2.5 CAS Registry No.: 7774-29-0
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves
- 3.2 **Symptoms Following Exposure:** All forms of exposure to this compound are hazardous. Acute systemic mercurialism may be fatal within a few minutes; death by uremic poisoning is usually delayed 5-12 days. Acute poisoning has resulted from inhaling dust concentrations of 1.2-8.5 mg/m<sup>3</sup> of air; symptoms include tightness and pain in chest, coughing, and difficulty in breathing. Ingestion causes necrosis, pain, vomiting, and severe purging. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; get medical attention. INGESTION: alimentary absorption is very rapid; action during first 10-15 min. determines prognosis. Give egg whites, milk, or activated charcoal and induce vomiting; consult physician. EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water.
- 3.4 **TLV-TWA:** 0.025 mg/m<sup>3</sup> (as mercury)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; oral LD<sub>50</sub> = 40 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** 0.1 mg/m<sup>3</sup> (as mercury)
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
**Products:** Fumes from fire may contain toxic mercury vapor.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold.
- 6.5 **GESAMP Hazard Profile:**  
**Bioaccumulation:** +  
**Damage to living resources:** 3  
**Human Oral hazard:** 3  
**Human Contact hazard:** II  
**Reduction of amenities:** XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent, 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 454.90
- 9.3 **Boiling Point at 1 atm:** 669°F = 354°C = 627°K
- 9.4 **Freezing Point:** 495°F = 257°C = 530°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 6.3 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 9.9 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# MERCURIC IODIDE

MID

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.001		N		N		N
36	0.001		O		O		O
38	0.001		T		T		T
40	0.001						
42	0.002		P		P		P
44	0.002		E		E		E
46	0.002		R		R		R
48	0.003		T		T		T
50	0.003		I		I		I
52	0.003		N		N		N
54	0.003		E		E		E
56	0.004		N		N		N
58	0.004		E		E		E
60	0.004		N		N		N
62	0.005		T		T		T
64	0.005						
66	0.005						
68	0.005						
70	0.006						
72	0.006						
74	0.006						
76	0.006						
78	0.007						
80	0.007						
82	0.007						
84	0.008						

# METHYL ISOBUTYL KETONE

MIK

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hexone Isobutyl methyl ketone Isopropyl acetone 4-Methyl-2-pentanone MIBK MIK	Watery liquid  Colorless  Mild pleasant odor  Floats and mixes slowly with water. Flammable, irritating vapor is produced.
<b>Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 18; Ketone  
2.2 Formula:  $(CH_3)_2CHCH_2COCH_3$   
2.3 IMO/UN Designation: 3.2/1245  
2.4 DOT ID No.: 1245  
2.5 CAS Registry No.: 108-10-1  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Organic canister or air pack; rubber gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Vapor causes irritation of eyes and nose; high concentrations cause anesthesia and depression. Liquid dries out skin and may cause dermatitis; irritates eyes but does not injure them.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air, give artificial respiration if needed; call a doctor. SKIN OR EYES: wash eyes thoroughly with water; wash skin with water until irritation stops.  
3.4 **TLV-TWA:** 50 ppm  
3.5 **TLV-STEL:** 75 ppm  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5$  to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.47 ppm  
3.13 **IDLH Value:** 500 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 75°F O.C. 73°F C.C.  
4.2 **Flammable Limits in Air:** 1.4%-7.5%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.  
4.6 **Behavior in Fire:** Vapors may travel a considerable distance and ignite.  
4.7 **Auto Ignition Temperature:** 854°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** (theor.) 1.8%, 0.5 day; (theor.) 12%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** U161  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 100.16  
9.3 **Boiling Point at 1 atm:** 241.2°F = 116.2 = 389.4°K  
9.4 **Freezing Point:** -119°F = -84°C = 189°K  
9.5 **Critical Temperature:** 568.9°F = 298.3°C = 571.5°K  
9.6 **Critical Pressure:** 475 psia = 32.3 atm = 3.27 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.802 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 23.6 dynes/cm = 0.0236 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 15.7 dynes/cm = 0.0157 N/m at 22.7°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.061  
9.12 **Latent Heat of Vaporization:** 149 Btu/lb = 82.5 cal/g = 3.45 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -10,400 Btu/lb = -5,800 cal/g = -242 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.8 psia

### NOTES

# METHYL ISOBUTYL KETONE

MIK

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	51.150	-30	0.426		N	77	3.800
40	50.990	-20	0.429		O		
45	50.830	-10	0.432		T		
50	50.660	0	0.435				
55	50.500	10	0.438		P		
60	50.340	20	0.441		E		
65	50.170	30	0.444		R		
70	50.010	40	0.447		T		
75	49.850	50	0.450		I		
80	49.680	60	0.453		N		
85	49.520	70	0.457		E		
90	49.360	80	0.460		N		
95	49.200	90	0.463		T		
100	49.030	100	0.466				
105	48.870	110	0.469				
110	48.710	120	0.472				
115	48.540	130	0.475				
120	48.380	140	0.478				
		150	0.481				
		160	0.484				
		170	0.487				
		180	0.490				
		190	0.493				
		200	0.496				
		210	0.499				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.000	40	0.109	40	0.00203	0	0.306
		50	0.157	50	0.00287	25	0.320
		60	0.222	60	0.00398	50	0.334
		70	0.308	70	0.00543	75	0.348
		80	0.422	80	0.00730	100	0.361
		90	0.569	90	0.00967	125	0.374
		100	0.757	100	0.01263	150	0.387
		110	0.995	110	0.01629	175	0.400
		120	1.290	120	0.02077	200	0.412
		130	1.655	130	0.02619	225	0.424
		140	2.101	140	0.03270	250	0.436
		150	2.641	150	0.04042	275	0.448
		160	3.289	160	0.04952	300	0.460
		170	4.060	170	0.06017	325	0.471
		180	4.971	180	0.07251	350	0.482
		190	6.039	190	0.08674	375	0.493
		200	7.284	200	0.10300	400	0.503
		210	8.724	210	0.12160	425	0.514
		220	10.380	220	0.14250	450	0.524
		230	12.280	230	0.16610	475	0.534
		240	14.430	240	0.19250	500	0.544
		250	16.880	250	0.22190	525	0.553
		260	19.630	260	0.25450	550	0.562
		270	22.710	270	0.29040	575	0.572
		280	26.160	280	0.33000	600	0.581
		290	29.990	290	0.37320		

# METHYL IODIDE

MIO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Iodomethane Monoiodomethane	Liquid  Colorless to brown  Odorless to sweet odor  Sinks and decomposes in water. Poisonous vapor cloud is formed.
Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR. Wear goggles, self-contained breathing apparatus, and protective impervious overclothing (including gloves.) Call fire department. Evacuate area in case of large leaks. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. POISONOUS AND IRRITATING GASES ARE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus, and protective overclothing (including gloves). EXTINGUISH WITH WATER, FOAM, OR CARBON DIOXIDE. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration (but NOT mouth-to-mouth). If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Not harmful to aquatic life May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: CHI3
- 2.3 IMO/UN Designation: 6.1/2644
- 2.4 DOT ID No.: 2644
- 2.5 CAS Registry No.: 74-88-4
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; goggles.
- 3.2 **Symptoms Following Exposure:** Inhalation of vapor causes lung congestion and pulmonary edema. Higher concentrations causes rapid narcosis and death. Contact with liquid irritates eyes and burns skin.
- 3.3 **Treatment of Exposure:** INHALATION: Remove victim to fresh air; give artificial respiration if needed. SKIN OR EYES: Flush with water of at least 15 min.
- 3.4 TLV-TWA: 2 ppm (skin)
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 51 mg/kg (guinea pig)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Odorless
- 3.13 IDLH Value: 100 ppm
- 3.14 OSHA PEL-TWA: 5 ppm
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Practically not flammable.
- 4.2 **Flammable Limits in Air:** 10% - 15%
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are generated when exposed to fire or heat.
- 4.6 **Behavior in Fire:** Containers may explode
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Decomposes
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial: not less than 99.5%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: 100 pounds
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: U138
- 8.9 EPA FWPCL List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 141.94
- 9.3 Boiling Point at 1 atm: 108.3°F = 42.4°C = 315.6°K
- 9.4 Freezing Point: -87.6°F = -66.5°C = 206.8°K
- 9.5 Critical Temperature: 490.6°F = 254.8°C = 528°K
- 9.6 Critical Pressure: 1068 psia = 72.7 atm = 7.37 MN/m<sup>2</sup>
- 9.7 Specific Gravity: 2.279 at 20°C (liquid)
- 9.8 Liquid Surface Tension: 25.8 dynes/cm = .026 N/m at 43°C
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: 4.89
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: 82.6 Btu/lb = 45.9 cal/g = 1.9 x 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: -4793 Btu/lb = -2663 cal/g = -111 x 10<sup>5</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: 12.8 psia

### NOTES

# METHYL IODIDE

MIO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	142.270		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130	0.592 0.577 0.562 0.548 0.534 0.520 0.507 0.494 0.481 0.469 0.457 0.445 0.433 0.422 0.411 0.401 0.390 0.380 0.371 0.361

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
59	1.800	-50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100	0.240 0.314 0.412 0.539 0.706 0.924 1.210 1.584 2.075 2.717 3.557 4.658 6.100 7.988 10.460 13.697		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.070 0.072 0.073 0.075 0.076 0.078 0.079 0.081 0.083 0.084 0.086 0.087 0.089 0.091 0.092 0.094 0.095 0.097 0.098 0.100 0.102 0.103 0.105 0.106 0.108

# METHYL ISOCYANATE

MIS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isocyanatomethane Isocyanic acid, methyl ester Methane, isocyanato- Methyl carbonimide MIC	Liquid  Colorless  Sharp, unpleasant odor
Floats; slowly mixes and slowly reacts with water at 20°C.	
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR. EVACUATE AREA.</b> Wear chemical protective suit with self-contained breathing apparatus. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES/VAPORS ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. WEAR CHEMICAL PROTECTIVE SUIT WITH SELF-CONTAINED BREATHING APPARATUS. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Combat fires from safe distance or protected location. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED OR IF SKIN EXPOSED. May cause fatal pulmonary edema. Respiratory distress cited for most deaths. Severely irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Liquid POISONOUS IF SWALLOWED OR IF SKIN EXPOSED. Causes eye injury and skin burns. Remove contaminated clothing and shoes. Flush affected areas with plenty of running water for at least 15 minutes. IF IN EYES, hold eyelids open and flush with plenty of running water. IF SWALLOWED and victim is CONSCIOUS, have victim drink a large quantity of water and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: CHNCO 2.3 IMO/UN Designation: 3.2/2480 2.4 DOT ID No.: 2480 2.5 CAS Registry No.: 624-83-9 2.6 NAERG Guide No.: 155 2.7 Standard Industrial Trade Classification: 51489
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Positive pressure breathing apparatus and special protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Poisonous; may be fatal if inhaled. Experimental exposure of four human subjects for 1 to 5 minutes to: 0.4 ppm - no effects; 2 ppm - irritation of nose and throat; 4 ppm - irritation more marked; 21 ppm - unbearable irritation of nose and throat. High concentrations can cause burning sensations in the nose and throat, coughing, dyspnea (difficult or painful breathing, gasping for breath), increased secretions, lung injury and subsequent pulmonary edema and uncontrollable vomiting. Most deaths (Bhopal, India, 1984) have been attributed to various forms of respiratory distress such as massive accumulation of fluid in the lungs or spasmodic contractions of the bronchial tubes. 3.3 <b>Treatment of Exposure:</b> INHALATION: Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoea at the site. EYES AND SKIN: Immediately flush eyes or skin with running water for at least 15 minutes, hold eyelids open occasionally, if appropriate. INGESTION: IF CONSCIOUS, give victim large quantities of water and induce vomiting by having victim touch the back of his throat. IF UNCONSCIOUS, do nothing except keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. 3.4 TLV-TWA: 0.02 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 3; LD <sub>50</sub> = 71 mg/kg (rat) 3.8 Toxicity by Inhalation: Currently not available. 3.9 <b>Chronic Toxicity:</b> Susceptible individuals may become sensitized so that subsequent exposure to extremely low concentrations provoke true asthma attacks. Cross sensitization to other isocyanates could also occur. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 3.11 <b>Liquid or Solid Characteristics:</b> Severe skin irritant. Causes second and third-degree burns on short contact and is very injurious to the eyes. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 IDLH Value: 3 ppm 3.14 OSHA PEL-TWA: 0.02 ppm 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEG1: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available
- 4.2 **Flammable Limits in Air:** 5.3% - 26%
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Contain toxic and irritating gases, including HCN and NOx.
- 4.6 **Behavior in Fire:** Very flammable; may be ignited by heat, sparks or flames. May travel to a source of ignition and flashback. Container may explode violently.
- 4.7 **Auto Ignition Temperature:** 995°F.
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 15.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 4.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly with water at room temperature (20°C) to produce gaseous CO<sub>2</sub>, methylamine (b.p. -6°C), and heat (about 585 Btu per lb of methyl isocyanate or about 3,700 Btu per lb of water). Resulting pressure increase may cause relief valves to open. Acids, alkalies and amides accelerate the reaction. Reactivity accelerates as temperature rises.
- 5.2 **Reactivity with Common Materials:** Avoid contact with all metals other than stainless steel and nickel. The metals may catalyze polymerization reactions. The heat of reaction can cause the trimerization to occur with explosive violence. Also attacks some plastics, rubber and coatings. Glass-lined containers (no pinholes) and fluorocarbon resin-lined transfer hoses are acceptable.
- 5.3 **Stability During Transport:** Drums may be stored at ambient temperatures out of direct sun. Keep as cool as practical and away from sources of heat, sparks, or flames. Protected from all contaminants. Cool bulk quantities to about 0°C.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Caustic soda
- 5.5 **Polymerization:** Pure methyl isocyanate polymerizes spontaneously. Commercial product requires only heat or a trace of catalyst to initiate a potentially violent reaction.
- 5.6 **Inhibitor of Polymerization:** No inhibitor identified as such. Residual trace phosgene from production inhibits polymerization and reaction with water.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Not pertinent
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial (99%)
- 7.2 **Storage Temperature:** It is recommended that bulk quantities be cooled to approximately 0°C. Drums may be stored at ambient temperature out of direct sunlight. Storage temperature should not exceed 30°C.
- 7.3 **Inert Atmosphere:** Must be protected by a dry nitrogen (dew point -40°C. or lower) atmosphere.
- 7.4 **Venting:** Not listed
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 10 pounds
- 8.7 EPA Pollution Category: A
- 8.8 RCRA Waste Number: P064
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 57.05
- 9.3 Boiling Point at 1 atm: 102.4°F. = 39.1°C. = 312.3°K
- 9.4 Freezing Point: <-112°F. = <-80°C. = <193°K.
- 9.5 Critical Temperature: 424°F. = 218°C. = 491°K.
- 9.6 Critical Pressure: 808 psia = 55 atm = 5.6 MN/m<sup>2</sup>
- 9.7 Specific Gravity: 0.9599 at 20°C. (liquid)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: 2.0
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: 223 Btu/lb = 124 cal/g = 5.19 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: 8,041 Btu/lb = 4,467 cal/g = 1.87 X 10<sup>7</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: -540 Btu/lb = -300 cal/g = -12.56 X 10<sup>5</sup> J/kg
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# METHYL ISOCYANATE

MIS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	59.800		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S  S L O W L Y	68	6.730	68	0.06800		C U R R E N T L Y  N O T  A V A I L A B L E



# METHYL ISOTHIOCYANATE

MIT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isothiocyanatomethane Isothiocyanic acid, methyl ester Methyl mustard oil	Solid  Colorless  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Wear self-contained breathing apparatus and full protective clothing. Shut off all sources of ignition. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	COMBUSTIBLE. Toxic fumes produced in fire. Flashback along vapor trail may occur. Wear self-contained breathing apparatus and full protective clothing. Extinguish with dry chemical or CO <sub>2</sub> .
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR ABSORBED THROUGH THE SKIN. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. If in eyes, hold eyelids open and flush with water for at least 15 minutes.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES: hold eyelids open, flush with water for at least 15 minutes. IF SWALLOWED: do nothing except keep victim warm. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Harmful to aquatic life. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: CH <sub>3</sub> NCS 2.3 IMO/UN Designation: 3.2/2477 2.4 DOT ID No.: 2477 2.5 CAS Registry No.: 556-61-6 2.6 NAERG Guide No.: 131 2.7 Standard Industrial Trade Classification: 51489
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus, chemical resistant gloves, safety goggles or safety faceshield (8 inch minimum), other protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Extremely destructive to the skin, eyes, nose, throat, and upper respiratory tract. Inhalation may be fatal due to spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. 3.3 <b>Treatment of Exposure:</b> Call a physician. EYES: Hold eyelids open, flush with water for at least 15 minutes. INGESTION: Do nothing except keep victim warm. DO NOT INDUCE VOMITING. SKIN: Remove contaminated clothing, flush affected areas with running water for at least 15 minutes. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 3; LD <sub>50</sub> = 97 mg/kg (rat) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Prolonged contact may cause lung inflammation, chest pain, and edema, which may be fatal. 3.10 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes. 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 90°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: CO<sub>2</sub>, dry chemical powder  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Emits toxic fumes of NO<sub>x</sub> and SO<sub>x</sub>.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 22.6 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 5.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.  
5.2 Reactivity with Common Materials: No reaction.  
5.3 Stability During Transport: Stable.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.  
5.5 Polymerization: Not pertinent.  
5.6 Inhibitor of Polymerization: Not pertinent.

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: LD<sub>50</sub> = 136 mg/kg (duck, oral)  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: None  
7.4 Venting: None  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 73.11  
9.3 Boiling Point at 1 atm: 246°F = 119°C = 392°K  
9.4 Freezing Point: 97°F = 36°C = 309°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 1.069 at 20°C  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 2.5  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.76 psia

## NOTES

# METHYL ISOTHIOCYANATE

MIT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
98	66.740		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	-20 0 20 40 60 80 100 120 140 160 180 200 220	0.036 0.058 0.093 0.149 0.239 0.383 0.614 0.985 1.580 2.533 4.061 6.511 10.440		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.219 0.224 0.228 0.233 0.237 0.242 0.246 0.250 0.255 0.259 0.263 0.267 0.272 0.276 0.280 0.284 0.288 0.292 0.296 0.300 0.303 0.307 0.311 0.314 0.318

# METHYL PROPYL KETONE

MKE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Pentanone	Liquid Water white
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Flammable. Flashback along vapor trail may occur. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}_2\text{COCH}_3$
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: 1249
- 2.5 CAS Registry No.: 107-87-9
- 2.6 NAERG Guide No.: 127
- 2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 TLV-TWA: 200 ppm.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: 250 ppm.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 1.6 \text{ g/kg (rat)}$
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 1,500 ppm
- 3.14 **OSHA PEL-TWA:** 200 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 45°F C.C.
- 4.2 **Flammable Limits in Air:** LEL: 1.6%; UEL: 8.2%
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.
- 4.6 **Behavior in Fire:** Flashback along vapor trail may occur.
- 4.7 **Auto Ignition Temperature:** 941°F.
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 0
  - Human Oral hazard: 1
  - Human Contact hazard: I
  - Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%; technical grades.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Not listed.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 86.13
- 9.3 **Boiling Point at 1 atm:** 215.1°F = 101.7°C = 374.7°K
- 9.4 **Freezing Point:** -107.5°F = -77.5°C = 195.5°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.809 @ 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL PROPYL KETONE

MKE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	6.750		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	68	0.522	68	0.00794		C U R R E N T L Y  N O T  A V A I L A B L E

# MALEIC ANHYDRIDE

MLA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> cis-Butenedioic anhydride 2,5-Furandione Toxicic anhydride	Molten; or solid crystals or tablets  Colorless  Choking odor  Sinks and mixes slowly with water.
Keep people away. Avoid contact with solid and liquid. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Dust cloud may be ignited by spark or flame. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: OCOCH=CHCO  
2.3 IMO/UN Designation: 9.0/2215  
2.4 DOT ID No.: 2215  
2.5 CAS Registry No.: 108-31-6  
2.6 NAERG Guide No.: 156  
2.7 Standard Industrial Trade Classification: 51381

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved organic vapor-acid gas canister; chemical goggles and face shield; rubber gloves and boots; coveralls or rubber apron.  
3.2 **Symptoms Following Exposure:** Inhalation causes coughing, sneezing, throat irritation. Skin contact causes irritation and redness. Vapors cause severe eye irritation; photophobia and double vision may occur.  
3.3 **Treatment of Exposure:** INHALATION: give oxygen. EYE OR SKIN CONTACT: flush with lots of water for at least 15 min.; for eyes, call a physician. For molten maleic burns, remove crust and treat as chemical and thermal burn.  
3.4 **TLV-TWA:** 0.25 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation, such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** 1.3 - 2.0 mg/m<sup>3</sup>  
3.13 **IDLH Value:** 10 mg/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 0.25 mg/m<sup>3</sup>  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** (Liquid) 215°F C.C.; 230°F O.C.  
4.2 **Flammable Limits in Air:** 1.4%-7.1%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** When heated above 300°F in the presence of various materials may generate heat and carbon dioxide. Will explode if confined.  
4.7 **Auto Ignition Temperature:** 878°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 1.4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 14.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Hot water may cause frothing. Reaction with cold water is slow and non-hazardous.  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Solid spills can usually be re-covered before any significant reaction with water occurs. Flush area of spill with water.  
5.5 **Polymerization:** Very unlikely at ordinary temperatures, even in the molten state.  
5.6 **Inhibitor of Polymerization:** None

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 150 ppm/24 hr/sunfish/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 50%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial: 99.5%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** U147  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 98.06  
9.3 **Boiling Point at 1 atm:** 392°F = 200°C = 473°K  
9.4 **Freezing Point:** 127°F = 53°C = 326°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.43 at 15°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -5936 Btu/lb = -3298 cal/g = -138.1 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -153 Btu/lb = -85.0 cal/g = -3.56 X 10<sup>3</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# MALEIC ANHYDRIDE

MLA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# MALEIC HYDRAZIDE

MLH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Dihydro-3,6-pyridazinedione 6-Hydroxy-3-(2h)-pyridazinone Malazide Maleic acid hydrazide Regulox		Solid	White	Odorless
		Sinks in water.		
Keep people away. Call fire department. Notify local health and pollution control agencies.				
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with water, dry chemicals, foam, or carbon dioxide.			
<b>Exposure</b>	Call for medical aid. DUST Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>4</sub> H <sub>4</sub> N <sub>2</sub> O <sub>2</sub> 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 123-33-1 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51577
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Goggles or face shield; dust mask. 3.2 <b>Symptoms Following Exposure:</b> Inhalation of dust causes irritation of nose and throat. Contact with eyes or skin causes irritation. Ingestion has been observed to cause tremors and muscle spasms in test animals. 3.3 <b>Treatment of Exposure:</b> INHALATION: move to fresh air. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. INGESTION: get medical attention. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; oral LD <sub>50</sub> = 3,800 mg/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Causes cancer in rats 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Odorless 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic nitrogen oxides are produced.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 97+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** U148
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 112.1
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 558°F = 292°C = 565°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.60 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -8,200 Btu/lb = -4,500 cal/g = -190 X 10<sup>6</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# MALEIC HYDRAZIDE

MLH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.600		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# MALEIC ACID

MLI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> cis-Butenedioic acid cis-1,2-Ethylenedicarboxylic acid Maleinic acid Malenic acid Toxicic acid	Solid                      White                      Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: HOOC-CH=CH-COOH
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2215
- 2.5 CAS Registry No.: 110-16-7
- 2.6 NAERG Guide No.: 156
- 2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air. EYES: immediately flush with plenty of water for 15 min.; get medical attention if irritation persists. SKIN: wash with soap and water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 708 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent (combustible solid)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Irritating smoke containing maleic anhydride may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 14.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** May corrode metals when wet.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 240 ppm/24-48 hr/mosquito fish/TL<sub>50</sub>/fresh water  
5 ppm/96 hr/fathead minnow/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 38%, 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent; Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 116.1
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 266°F = 130°C = 403°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.59 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** -5,000 Btu/lb = -2,800 cal/g = -117 X 10<sup>6</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# MALEIC ACID

MLI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	79.000		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

# METHYL ALLYL ALCOHOL

MLL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Methyl-2-propen-1-ol		Liquid	Colorless	Pungent odor
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.				
<b>Fire</b>	Flammable. Flashback along vapor trail may occur. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:**  $\text{H}_2\text{C}=\text{C}(\text{CH}_3)\text{CH}_2\text{OH}$
- 2.3 **IMO/UN Designation:** Currently not available
- 2.4 **DOT ID No.:** Not listed.
- 2.5 **CAS Registry No.:** Currently not available
- 2.6 **NAERG Guide No.:** Not listed
- 2.7 **Standard Industrial Trade Classification:** 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 92°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.
- 4.6 **Behavior in Fire:** Flashback along vapor trail may occur.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 2
  - Human Oral hazard: (2)
  - Human Contact hazard: 1
  - Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%; technical grades.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Not listed.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 72.10
- 9.3 **Boiling Point at 1 atm:** 239°F = 115°C = 388°K
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.8515 @ 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL ALLYL ALCOHOL

MLL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	7.110		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# 3-METHYLPYRIDINE

MLP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 3-Picoline b-Picoline m-Picoline Pyridine, 3-methyl UN 2313 (DOT)	Liquid  Miscible with water.	Colorless  	Sweetish, not unpleasant
<b>Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Evacuate area. Wear chemical protective suit with self-contained breathing apparatus. Shut off ignition sources. Call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.			
<b>Fire</b>	COMBUSTIBLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear chemical protective suit with self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Poisonous if inhaled or if skin is exposed. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Poisonous if swallowed or if skin is exposed. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 9; Aromatic amine  
2.2 Formula: C<sub>6</sub>H<sub>7</sub>N  
2.3 IMO/UN Designation: 3.3/2313  
2.4 DOT ID No.: 2313  
2.5 CAS Registry No.: 108-99-6  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51577

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self contained breathing apparatus, protective clothing, rubber boots, and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** HARMFUL if swallowed, inhaled or absorbed through skin. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes and skin. Inhalation may be fatal as a result of spasm, inflammation of larynx and bronchi, chemical pneumonitis and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical help. Remove victim to fresh air. If victim is not breathing give artificial respiration. If breathing is difficult, give oxygen. SKIN: Immediately flush with copious amounts of water for at least 15 minutes, while removing contaminated shoes and clothing. EYES: Immediately flush eyes with copious amounts of water for at least 15 minutes. Assure adequate flushing of the eyes by opening the eyelids with fingers.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 400 mg/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Causes damage to liver and kidney.  
3.10 Vapor (Gas) Irritant Characteristics: Vapor causes severe irritation to eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second and third degree burn on short contact and is very injurious to the eyes.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 97°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical, alcohol foam.  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Vapors may travel considerable distance to a source of ignition and flashback. Forms explosive mixtures in air. Emits toxic fumes under fire conditions.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 1000°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 41.6 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 10.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Flush with water  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99.5%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: C  
7.6 Ship Type: 2  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable Liquid.  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 93.13  
9.3 Boiling Point at 1 atm: 291.2°F = 144°C = 417.2°K  
9.4 Freezing Point: .94°F = -18.3°C = 254.9°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 0.957  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Currently not available  
9.11 Ratio of Specific Heats of Vapor (Gas): 3.2  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# 3-METHYLPYRIDINE

MLP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	68	0.085		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.233 0.246 0.259 0.271 0.283 0.295 0.307 0.319 0.330 0.341 0.352 0.363 0.374 0.384 0.394 0.404 0.414 0.424 0.433 0.443 0.452 0.461 0.469 0.478 0.486

# MALATHION

MLT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cythion insecticide	Liquid	Yellow to dark brown	Skunk-like odor
Sinks in water. Freezing point is 37°F.			
<b>Keep people away. AVOID CONTACT WITH LIQUID.</b> <b>Wear chemical protective suit with self-contained breathing apparatus.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b>			
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED. Containers may explode in fire. Wear chemical protective suit with self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, water, or foam. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Pump Chemical and Physical Treatment: Absorb Clean shore line	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> Not listed. <b>2.2 Formula:</b> C <sub>10</sub> H <sub>16</sub> O <sub>6</sub> PS <sub>2</sub> <b>2.3 IMO/UN Designation:</b> 6.1/2783 <b>2.4 DOT ID No.:</b> 2783 <b>2.5 CAS Registry No.:</b> 121-75-5 <b>2.6 NAERG Guide No.:</b> 152 <b>2.7 Standard Industrial Trade Classification:</b> 51631
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<b>3. HEALTH HAZARDS</b>  <b>3.1 Personal Protective Equipment:</b> Wear self-contained breathing apparatus (or respirator for organophosphate pesticides) and rubber clothing while fighting fires of malathion with chlorine bleach solution. All clothing contaminated by fumes and vapors must be decontaminated.  <b>3.2 Symptoms Following Exposure:</b> Exposure to fumes from a fire or to liquid causes headache, blurred vision, constricted pupils of the eyes, weakness, nausea, cramps, diarrhea, and tightness in the chest. Muscles twitch and convulsions may follow. The symptoms may develop over a period of 8 hours.  <b>3.3 Treatment of Exposure:</b> Speed is essential. <b>INHALATION:</b> in the nonbreathing victim immediately institute artificial respiration, using the mouth-to-mouth, the mouth-to-nose, or the mouth-to-oropharyngeal method. Call physician <b>INGESTION:</b> administer milk, water or salt-water and induce vomiting repeatedly. <b>SKIN OR EYE CONTACT:</b> flood and wash exposed skin areas thoroughly with water. Remove contaminated clothing under a shower. Administer atropine, 2 mg(1/30 gr) intramuscularly or intravenously as soon as any local or systemic signs or symptoms of an intoxication are noted; repeat the administration of atropine every 3-8 min. until signs of atropinization (mydriasis, dry mouth, rapid pulse, hot and dry skin) occur; initiate treatment in children with 1 mg of atropine. Watch respiration, and remove bronchial secretions if they appear to be obstructing the airway; intubate if necessary. Give 2-PAM (Pralidoxime; Protopam), 2.5 gm in 100 ml of sterile water or in 5% dextrose and water, intravenously, slowly, in 15-30 min.; if sufficient fluid is not available, give 1 gm of 2-PAM in 3 ml of distilled water by deep intramuscular injection; repeat this every half hour if respiration weakens or if muscle fasciculation or convulsions recur.  <b>3.4 TLV-TWA:</b> 10 mg/m <sup>3</sup> <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5 to 5g/kg(rat) <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> None likely <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> 250 mg/m <sup>3</sup> <b>3.14 OSHA PEL-TWA:</b> 15 mg/m <sup>3</sup> (total dust) <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed
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## 4. FIRE HAZARDS

- 4.1 Flash Point: >325°F
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, water spray, foam
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion  
Products: Vapors and fumes from fires are hazardous. They include sulfur dioxide and phosphoric acid.
- 4.6 Behavior in Fire: Gives off hazardous fumes. Area surrounding fire should be diked to prevent water runoff.
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 92.8 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 22.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: None
- 5.2 Reactivity with Common Materials: No hazardous reaction
- 5.3 Stability During Transport: Not pertinent
- 5.4 Neutralizing Agents for Acids and Caustics: Liquid bleach solution for decontamination.
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
0.09 ppm/96 hr/bluegill/TL<sub>m</sub>/fresh water  
0.033-0.083 ppm/96 hr/marine crustaceae/LC<sub>50</sub>
- 6.2 Waterfowl Toxicity: LD<sub>50</sub> = 1485 mg/kg
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: CYTHION or Malathion ULV Concentrate Insecticide. Was sold under several trade names.
- 7.2 Storage Temperature: Below 120°F. Decomposition (non-hazardous) occurs at higher temperatures.
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: ORM-A
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: Yes
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 100 pounds
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 330.36
- 9.3 Boiling Point at 1 atm: Very high
- 9.4 Freezing Point: 37°F = 2.9°C = 276°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.234 at 25°C (liquid)
- 9.8 Liquid Surface Tension: 37.1 dynes/cm = 0.0371 N/m at 24°C
- 9.9 Liquid Water Interfacial Tension: 19 dynes/cm = 0.019 N/m at 24°C
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

NOTES

# MALATHION

MLT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	77.089	85	0.380	N O T  P E R T I N E N T		70	45.270
78	77.089	90	0.384			72	42.680
79	77.089	95	0.389			74	40.260
80	77.089	100	0.393			76	37.990
81	77.089	105	0.398			78	35.870
82	77.089	110	0.402			80	33.880
83	77.089	115	0.406			82	32.020
84	77.089	120	0.411			84	30.270
85	77.089	125	0.415			86	28.620
86	77.089	130	0.420			88	27.080
87	77.089	135	0.424			90	25.630
88	77.089	140	0.429			92	24.270
89	77.089	145	0.433			94	22.990
90	77.089	150	0.438			96	21.780
91	77.089					98	20.650
92	77.089					100	19.580
93	77.089					102	18.580
94	77.089					104	17.630
95	77.089					106	16.740
96	77.089					108	15.900
97	77.089					110	15.100
98	77.089					112	14.350
99	77.089					114	13.650
100	77.089					116	12.980
101	77.089					118	12.350
102	77.089					120	11.750

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.014		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# METHYL MERCAPTAN

MMC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Mercaptomethane Methaneethiol Methyl sulphydrate Thiomethyl alcohol	Liquefied compressed gas Colorless Strong garlic odor  Floats and boils on water. Poisonous, flammable vapor is produced.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Evacuate area in case of large discharge. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Let fire burn. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Chemical and Physical Treatment: Burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: CH <sub>3</sub> SH 2.3 IMO/UN Designation: 2/1064 2.4 DOT ID No.: 1064 2.5 CAS Registry No.: 74-93-1 2.6 NAERG Guide No.: 117 2.7 Standard Industrial Trade Classification: 51549
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Rubber gloves; goggles or face shield; air-line or self-contained breathing apparatus. 3.2 <b>Symptoms Following Exposure:</b> Inhalation causes irritation of respiratory system, tremors, paralysis, unconsciousness; death may follow respiratory paralysis. Contact with liquid irritates eyes and skin. Ingestion causes irritation of mouth and stomach plus symptoms described for inhalation. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove patient immediately from the contaminated area; keep him warm and at complete rest; if necessary give artificial respiration until medical assistance can be obtained; oxygen or oxygen-CO <sub>2</sub> inhalation is recommended, continuing after spontaneous breathing has returned. EYES: for exposure to vapor, apply hot and cold compresses to reduce pain of conjunctivitis; for exposure to liquid, wash with water and obtain medical assistance. SKIN: wash with water. INGESTION: induce vomiting and follow with gastric lavage.  3.4 TLV-TWA: 0.5 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Currently not available 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: 0.0021 ppm 3.13 IDLH Value: 150 ppm 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: 10 ppm 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (flammable, liquefied compressed gas)
- 4.2 **Flammable Limits in Air:** 3.9%-21.8%
- 4.3 **Fire Extinguishing Agents:** Preferably let fire burn, stop gas flow. Fires may be extinguished with dry chemical, foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Irritating sulfur dioxide is produced.
- 4.6 **Behavior in Fire:** Containers may explode.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 3.8 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 14.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 4.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.0 ppm/105 min/white bass/death/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: (T)  
Damage to living resources: 4  
Human Oral hazard: (2)  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.5+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison gas
- 8.2 **49 CFR Class:** 2.3
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 4              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U153
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 48.1
- 9.3 **Boiling Point at 1 atm:** 43.2°F = 6.2°C = 279.4°K
- 9.4 **Freezing Point:** -189°F = 123°C = 150°K
- 9.5 **Critical Temperature:** 386.2°F = 196.8°C = 470°K
- 9.6 **Critical Pressure:** 1,050 psia = 71.4 atm = 7.25 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.892 at 6°C (liquid)
- 9.8 **Liquid Surface Tension:** 31 dynes/cm = 0.031 N/m at 5°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 1.66
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1988
- 9.12 **Latent Heat of Vaporization:** 220 Btu/lb = 122 cal/g = 5.10 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -11,054 Btu/lb = -6,141 cal/g = -257.0 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 29.35 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# METHYL MERCAPTAN

MMC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	57.730	0	0.436	0	1.282	-35	0.255
5	57.490	5	0.436	5	1.265	-30	0.250
10	57.250	10	0.437	10	1.249	-25	0.245
15	57.010	15	0.438	15	1.233	-20	0.241
20	56.760	20	0.438	20	1.216	-15	0.237
25	56.520	25	0.439	25	1.200	-10	0.232
30	56.280	30	0.440	30	1.184	-5	0.229
35	56.030	35	0.440	35	1.167	0	0.225
40	55.791	40	0.441	40	1.151	5	0.221
						10	0.218
						15	0.214
						20	0.211
						25	0.208
						30	0.205
						35	0.202
						40	0.199

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
59	2.400	-35	1.655	-35	0.01746	0	0.233
		-30	1.947	-30	0.02031	25	0.238
		-25	2.283	-25	0.02354	50	0.244
		-20	2.667	-20	0.02718	75	0.250
		-15	3.105	-15	0.03129	100	0.255
		-10	3.602	-10	0.03590	125	0.261
		-5	4.166	-5	0.04105	150	0.266
		0	4.802	0	0.04681	175	0.272
		5	5.519	5	0.05322	200	0.277
		10	6.323	10	0.06033	225	0.283
		15	7.225	15	0.06820	250	0.289
		20	8.232	20	0.07690	275	0.294
		25	9.354	25	0.08648	300	0.300
		30	10.600	30	0.09701	325	0.305
		35	11.980	35	0.10860	350	0.311
		40	13.520	40	0.12120	375	0.316
		45	15.210	45	0.13500	400	0.322
		50	17.070	50	0.15000	425	0.328
		55	19.110	55	0.16640	450	0.333
		60	21.360	60	0.18420	475	0.339
		65	23.820	65	0.20340	500	0.344
						525	0.350
						550	0.355
						575	0.361
						600	0.367

# MONOMETHYL ETHANOLAMINE

MME

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-(Methylamino)ethanol N-Methyl ethanolamine		Liquid	Colorless
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CH}_3\text{NHCH}_2\text{CH}_2\text{OH}$
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: Not listed.
- 2.5 CAS Registry No.: 109-83-1
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51461

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 2.34 \text{ g/kg (rat)}$
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 165°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as nitrogen oxides and carbon monoxide, may be formed when involved in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 27.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 2
  - Human Oral hazard: 1
  - Human Contact hazard: I
  - Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%; technical grades.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Not listed.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 75.11
- 9.3 **Boiling Point at 1 atm:** 319.1°F = 159.5°C = 432.5°K
- 9.4 **Freezing Point:** 23.9°F = -4.5°C = 268.5°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.9414
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# MONOMETHYL ETHANOLAMINE

MME

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# METHYL METHACRYLATE

MMM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methacrylate monomer Methacrylic acid, methyl ester Methyl a-methylacrylate Methyl 2-methyl-2-propenoate	Liquid  Colorless  Pleasant sharp odor  Floats on water. Flammable, irritating vapor is produced.
<b>Keep people away. Avoid contact with liquid and vapor. Evacuate.</b> <b>Restrict human use; farm use.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	<b>FLAMMABLE:</b> Flashback along vapor trail may occur. Container may explode when heated. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from safe distance or protected location. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Collection Systems: Skim Chemical and Physical Treatment: Absorb Clean shore line Salvage waterfowl	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 <b>CG Compatibility Group:</b> 14; Acrylate 2.2 <b>Formula:</b> CH <sub>2</sub> =C(CH <sub>3</sub> )COOCH <sub>3</sub> 2.3 <b>IMO/UN Designation:</b> 3.2/1247 2.4 <b>DOT ID No.:</b> 1247 2.5 <b>CAS Registry No.:</b> 80-62-6 2.6 <b>NAERG Guide No.:</b> 129P 2.7 <b>Standard Industrial Trade Classification:</b> 51373
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Air mask; plastic gloves; goggles. 3.2 <b>Symptoms Following Exposure:</b> Irritation of eyes, nose, and throat. Nausea and vomiting. Liquid may cause skin irritation. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove to fresh air; apply artificial respiration and oxygen if needed; refer to physician. SKIN OR EYES: flush with plenty of water for 15 min.; refer to physician for eye exposure. 3.4 <b>TLV-TWA:</b> 100 ppm 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 1; LD <sub>50</sub> = 5 to 15 g/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 3.11 <b>Liquid or Solid Characteristics:</b> Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure. 3.12 <b>Odor Threshold:</b> 0.05 ppm 3.13 <b>IDLH Value:</b> 1,000 ppm 3.14 <b>OSHA PEL-TWA:</b> 100 ppm 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 50°F O.C.  
4.2 **Flammable Limits in Air:** 2.1%-12.5%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. Containers may explode in fire or when heated because of polymerization.  
4.7 **Auto Ignition Temperature:** 790°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 2.5 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Heat, oxidizing agents, and ultraviolet light may cause polymerization.  
5.6 **Inhibitor of Polymerization:** Hydroquinone, 22-65 ppm; hydroquinone methyl ether, 22-120 ppm; dimethyl tert-butylphenol, 45-65 ppm

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 250 ppm/96 hr/bluegill/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** (theor.) 47%, 10 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.8%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	2

  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** U162  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 100.12  
9.3 **Boiling Point at 1 atm:** 214°F = 101°C = 374°K  
9.4 **Freezing Point:** -54°F = -48°C = 225°K  
9.5 **Critical Temperature:** 561.2°F = 294°C = 567.2°K  
9.6 **Critical Pressure:** 485 psia = 33 atm = 3.3 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.945 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 28 dynes/cm = 0.028 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 14.3 dynes/cm = 0.0143 N/m at 22.7°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.059  
9.12 **Latent Heat of Vaporization:** 140 Btu/lb = 77 cal/g = 3.2 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -11,400 Btu/lb = -6,310 cal/g = -264 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** -248 Btu/lb = -138 cal/g = -5.78 X 10<sup>5</sup> J/kg  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.5 psia (Approx.)

## NOTES

# METHYL METHACRYLATE

MMM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	60.310	20	0.432	65	1.030	35	0.732
40	60.120	30	0.435	70	1.023	40	0.703
45	59.930	40	0.438	75	1.015	45	0.675
50	59.740	50	0.441	80	1.008	50	0.649
55	59.550	60	0.444	85	1.000	55	0.624
60	59.360	70	0.448	90	0.993	60	0.601
65	59.170	80	0.451	95	0.985	65	0.579
70	58.980	90	0.454	100	0.978	70	0.558
75	58.780	100	0.457	105	0.971	75	0.538
80	58.590	110	0.460	110	0.963	80	0.520
85	58.400	120	0.463	115	0.956	85	0.502
90	58.210	130	0.466	120	0.948	90	0.485
95	58.020	140	0.469	125	0.941	95	0.469
100	57.830	150	0.472	130	0.934	100	0.454
105	57.640	160	0.475	135	0.926	105	0.440
110	57.450	170	0.478	140	0.919	110	0.426
115	57.260	180	0.481	145	0.911	115	0.413
120	57.070	190	0.484	150	0.904	120	0.400
		200	0.487	155	0.897	125	0.389
		210	0.490	160	0.889	130	0.377
				165	0.882	135	0.367
				170	0.874	140	0.356
				175	0.867		
				180	0.859		
				185	0.852		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.500	20	0.124	20	0.00241	0	0.321
		30	0.178	30	0.00339	25	0.334
		40	0.250	40	0.00468	50	0.348
		50	0.347	50	0.00635	75	0.361
		60	0.473	60	0.00849	100	0.373
		70	0.635	70	0.01119	125	0.386
		80	0.843	80	0.01456	150	0.398
		90	1.103	90	0.01872	175	0.410
		100	1.428	100	0.02379	200	0.422
		110	1.828	110	0.02992	225	0.434
		120	2.316	120	0.03726	250	0.445
		130	2.906	130	0.04596	275	0.457
		140	3.613	140	0.05619	300	0.468
		150	4.454	150	0.06814	325	0.478
		160	5.448	160	0.08200	350	0.489
		170	6.612	170	0.09794	375	0.499
		180	7.968	180	0.11620	400	0.509
		190	9.538	190	0.13690	425	0.519
		200	11.340	200	0.16040	450	0.529
		210	13.410	210	0.18670	475	0.539
		220	15.760	220	0.21630	500	0.548
		230	18.420	230	0.24910	525	0.557
		240	21.420	240	0.28550	550	0.566
		250	24.780	250	0.32570	575	0.574
		260	28.540	260	0.36990	600	0.583
		270	32.720	270	0.41830		

# 1-METHYLNAPHTHALENE

MNA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> alpha-Methylnaphthalene	Liquid (oil)      Colorless  Sinks slowly in water. Freezing point is 25.6°F.
Keep people away. Shut off ignition sources. Call fire department. Wear self-contained positive pressure breathing apparatus and full protective clothing. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish with water, dry chemical, foam or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Harmful if inhaled. May irritate the eyes and skin and photosensitize the skin. Move victim to fresh air. If in eyes, hold eyelids open and flush with running water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed. May irritate the eyes and skin and photosensitize the skin. IF IN EYES OR ON SKIN: immediately flush with running water for at least 15 minutes; hold eyelids open if appropriate. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS, have victim drink large volumes of warm water and induce vomiting. IF SWALLOWED and the victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Stop discharge. Contain. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 32; Aromatic hydrocarbons  
2.2 Formula:  $C_{10}H_7CH_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 90-12-0  
2.6 NAERG Guide No.: Not listed.  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, safety goggles, coveralls, rubber shoes or boots, and hydrocarbon vapor canister mask.  
3.2 **Symptoms Following Exposure:** Harmful if inhaled. Liquid causes irritation of the eyes and skin and skin photosensitization. Harmful if swallowed. Chronic exposure may cause liver or kidney damage.  
3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air; call for medical aid. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Immediately flush with running water for at least 15 minutes. Hold eyelids open if appropriate. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain body temperature. INGESTION: If victim is conscious, have victim drink large amounts of warm water and induce vomiting by touching a finger to the back of the throat. If the victim is unconscious or having convulsions, do nothing except keep victim warm.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1;  $LD_{50}$  = 5000 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Mutagenic, tumor promoting.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** 0.023 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 180°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, foam or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 984°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 64.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Currently not available  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Low potential  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 142.20  
9.3 **Boiling Point at 1 atm:** 464-469°F = 240-243°C = 513-516°K  
9.4 **Freezing Point:** 25.6°F = -3.6°C = 269.4°K  
9.5 **Critical Temperature:** >923°F = >495°C = >768°K  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.0202 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.91  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** -17,508.96 Btu/lb = -9,772.77 cal/g = -410.45 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1-METHYLNAPHTHALENE

MNA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	63.630		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	300 325 350 375 400 425 450	1.029 1.646 2.543 3.813 5.568 7.947 11.114		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# MINERAL SPIRITS

MNS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Naphtha Petroleum spirits	Watery liquid  Colorless  Gasoline-like odor
Floats on water.	
Keep people away. Avoid contact with liquid. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** Not applicable  
2.3 **IMO/UN Designation:** 3.3/1300  
2.4 **DOT ID No.:** 1268  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 128  
2.7 **Standard Industrial Trade Classification:** 33429

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Plastic gloves; goggles or face shield (as for gasoline).  
3.2 **Symptoms Following Exposure:** INHALATION: mild irritation of respiratory tract. ASPIRATION: severe lung irritation and rapidly developing pulmonary edema; central nervous system excitement followed by depression. INGESTION: irritation of stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. ASPIRATION: enforce bed rest; give oxygen; call a doctor. INGESTION: do NOT induce vomiting; guard against aspiration into lungs. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 105–140°F C.C., depending on grade  
4.2 **Flammable Limits in Air:** 0.8%-5.0%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use straight hose water stream.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 540°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 8%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Various grades available. 70-100% of the materials are derived from petroleum, and 0-30% are aromatic hydrocarbons like benzene and toluene. Flash points vary with the exact composition but are usually above 100°F.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 310–395°F = 154–202°C = 428–475°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.78 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.030  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.13 psia

### NOTES

# MINERAL SPIRITS

MNS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	48.690	10	0.433	10	0.925	50	9.343
52	48.690	15	0.435	20	0.919	52	8.841
54	48.690	20	0.438	30	0.914	54	8.370
56	48.690	25	0.440	40	0.908	56	7.927
58	48.690	30	0.443	50	0.903	58	7.511
60	48.690	35	0.445	60	0.897	60	7.119
62	48.690	40	0.448	70	0.892	62	6.751
64	48.690	45	0.450	80	0.886	64	6.404
66	48.690	50	0.453	90	0.881	66	6.078
68	48.690	55	0.455	100	0.875	68	5.770
70	48.690	60	0.458	110	0.869	70	5.481
72	48.690	65	0.460	120	0.864	72	5.207
74	48.690	70	0.462	130	0.858	74	4.950
76	48.690	75	0.465	140	0.853	76	4.707
78	48.690	80	0.467	150	0.847	78	4.477
80	48.690	85	0.470	160	0.842	80	4.260
82	48.690	90	0.472	170	0.836	82	4.056
84	48.690	95	0.475	180	0.831	84	3.862
86	48.690	100	0.477	190	0.825	86	3.679
88	48.690	105	0.480	200	0.820	88	3.506
90	48.690			210	0.814	90	3.342
92	48.690			220	0.808	92	3.187
94	48.690			230	0.803	94	3.040
96	48.690			240	0.797	96	2.901
98	48.690			250	0.792	98	2.770
100	48.690			260	0.786	100	2.645

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	90	0.094		N		N
	N	100	0.124		O		O
	S	110	0.163		T		T
	O	120	0.211				
	L	130	0.272		P		P
	U	140	0.347		E		E
	B	150	0.440		R		R
	L	160	0.553		T		T
	E	170	0.691		I		I
		180	0.856		N		N
		190	1.054		E		E
		200	1.290		N		N
		210	1.569		T		T
		220	1.897				
		230	2.281				
		240	2.728				
		250	3.247				
		260	3.846				
		270	4.535				
		280	5.323				
		290	6.221				
		300	7.241				
		310	8.394				
		320	9.695				
		330	11.160				
		340	12.790				

# MERCURIC NITRATE

MNT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Mercury (II) nitrate Mercury nitrate monohydrate Mercury pernitrate	Solid  White  Sharp odor  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear dust respirator and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b> <b>DUST</b> POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>SOLID</b> POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Hg}(\text{NO}_3)_2 \cdot \text{H}_2\text{O}$
- 2.3 IMO/UN Designation: 6.1/1625
- 2.4 DOT ID No.: 1625
- 2.5 CAS Registry No.: 10045-94-0
- 2.6 NAERG Guide No.: 141
- 2.7 Standard Industrial Trade Classification: 52359

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves
- 3.2 **Symptoms Following Exposure:** Acute systemic poisoning may be fatal within a few minutes; death by uremic poisoning is usually delayed 5-12 days. Acute poisoning has resulted from inhaling dust concentrations of 1.2-8.5  $\text{mg}/\text{m}^3$  of air; symptoms include tightness and pain in chest, coughing, and difficulty in breathing. Ingestion causes necrosis, pain, vomiting, and severe purging. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; get medical attention. INGESTION: alimentary absorption is very rapid; action during first 10-15 min. determines prognosis. Give egg whites, milk, or activated charcoal and induce vomiting; consult physician. EYES or SKIN: flush with water.
- 3.4 TLV-TWA: 0.025  $\text{mg}/\text{m}^3$  (as mercury)
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: 0.1  $\text{mg}/\text{m}^3$  (as mercury)
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable, but may intensify fire
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
**Products:** Vapors from fire may contain toxic mercury and oxides of nitrogen.
- 4.6 **Behavior in Fire:** May increase intensity of fire if in contact with burning material
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves, then forms cloudy acid solution. The reaction is not hazardous.
- 5.2 **Reactivity with Common Materials:**  
Solution will corrode most metals. Solid in contact with wood or paper may cause fire.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Cautics:** Flush well with water, rinse with dilute solution of sodium bicarbonate or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Possible bioaccumulation problem. Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold.
- 6.5 **GESAMP Hazard Profile:**  
**Bioaccumulation:** +  
**Damage to living resources:** 4  
**Human Oral hazard:** 3  
**Human Contact hazard:** II  
**Reduction of amenities:** XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent, 99.0%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: Yes
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 10 pounds
- 8.7 EPA Pollution Category: A
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 342.6
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 4.3 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# MERCURIC NITRATE

MNT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 3-METHOXYBUTYL ACETATE

MOA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, 3-methoxybutyl ester 1-Butanol, 3-methoxyacetate Butoxyl Methyl-1,3-butylene glycol acetate UN 2708 (DOT)	Liquid  Acrid odor
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Water may be ineffective on fire. Wear self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be harmful. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, immediately induce vomiting.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters
- 2.2 Formula: C<sub>7</sub>H<sub>14</sub>O<sub>3</sub>
- 2.3 IMO/UN Designation: 3.3/2708
- 2.4 DOT ID No.: 2708
- 2.5 CAS Registry No.: 4435-53-4
- 2.6 NAERG Guide No.: 127
- 2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** Causes eye and skin irritation. Mildly toxic by ingestion.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Immediately induce vomiting. EYES - OR - SKIN: Flush with copious amounts of water for at least 15 minutes.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 4.2 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 170°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Alcohol foam, carbon dioxide, dry chemicals
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** When heated to decomposition, emits acrid smoke and irritating fumes.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** No reaction.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not occur.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid.
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 146.19
- 9.3 **Boiling Point at 1 atm:** 275°F = 135°C = 408.2°K
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.96
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 5.05
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 3-METHOXYBUTYL ACETATE

MOA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.268 0.279 0.290 0.301 0.312 0.322 0.333 0.343 0.353 0.363 0.373 0.382 0.392 0.401 0.410 0.419 0.428 0.436 0.445 0.453 0.461 0.469 0.477 0.485 0.492

# METHOXYCHLOR

MOC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> DMDT Marlate 50 Methoxy DDT 2,2-bis-(p-Methoxyphenyl)-1,1,1-trichloroethane	Solid  White to light yellow  Mild fruity odor  Sinks in water.
<b>Call fire department. KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST. Wear goggles and dust respirator. Stay upwind, use water spray to "knock down" dust. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C <sub>16</sub> H <sub>16</sub> Cl <sub>3</sub> O <sub>2</sub> 2.3 IMO/UN Designation: 6.1/2761 2.4 DOT ID No.: 2761 2.5 CAS Registry No.: 72-43-5 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 51139
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Dust respirator if needed; gloves and goggles. 3.2 <b>Symptoms Following Exposure:</b> Toxicity is relatively low. Inhalation or ingestion causes generalized depression. 3.3 <b>Treatment of Exposure:</b> EYES: flush with water if irritated. SKIN: wash well with soap and water. INGESTION: consult physician. 3.4 TLV-TWA: 10 mg/m <sup>3</sup> 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 1; LD <sub>50</sub> = 5 to 15 g/kg 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: 5,000 mg/m <sup>3</sup> 3.14 OSHA PEL-TWA: 15 mg/m <sup>3</sup> (total dust) 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Burns only at high temperatures. For liquid forms, see Kerosene.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride gas may be formed in fire.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 85.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 25.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.035 ppm/96 hr/fathead/TL<sub>50</sub>/fresh water  
0.004-.012 ppm/96 hr/marine crustacea/TL<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** LD<sub>50</sub> = 2,000 mg/kg
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical flake or chip: 88% plus 12% isomers; Wettable powders: 50-75%; Dust concentrate: 40% Emulsifiable concentrate (liquid): 25% solution in petroleum distillate.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** U247/D014
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 345.7
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 171–192°F = 77–89°C = 350–362°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.41 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# METHOXYCHLOR

MOC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# MERCURIC OXIDE

MOX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Mercuric oxide, red Mercuric oxide, yellow Mercury oxide	Solid  Red, orange or yellow  Odorless  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear dust respirator and rubber overclothing (including gloves). Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: HgO 2.3 IMO/UN Designation: 6.1/1641 2.4 DOT ID No.: 1641 2.5 CAS Registry No.: 1344-45-2 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 52269
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Dust mask; goggles or face shield; protective gloves 3.2 <b>Symptoms Following Exposure:</b> Acute systemic poisoning may be fatal within a few minutes; death by uremic poisoning is usually delayed 5-12 days. Acute poisoning has resulted from inhaling dust concentrations of 1.2-8.5 mg/m <sup>3</sup> of air; symptoms include tightness and pain in chest, coughing, and difficulty in breathing. Ingestion causes necrosis, pain, vomiting, and severe purging. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove victim to fresh air; get medical attention. INGESTION: alimentary absorption is very rapid; action during first 10-15 min. determines prognosis. Give egg whites, milk, or activated charcoal and induce vomiting; consult physician. EYES: flush with water for at least 15 min. SKIN: wash with soap and water. 3.4 <b>TLV-TWA:</b> 0.025 mg/m <sup>3</sup> (as mercury) 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 4; oral LD <sub>50</sub> = 18 mg/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Causes birth defects in rats 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Odorless 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> 0.1 mg/m <sup>3</sup> (as mercury) 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable, but may intensify fire
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Fumes from fire may contain poisonous mercury vapor.
- 4.6 **Behavior in Fire:** Decomposes at 500°C into mercury and oxygen, which can increase intensity of fire. Solid changes color when hot.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.29 ppm/48 hr/marine fish/TL<sub>m</sub>
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Red-technical; reagent; purified Yellow-technical; NF; reagent
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 216.61
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 11.1 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# MERCURIC OXIDE

MOX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# MONOISOPROPANOLAMINE

MPA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Amino-2-propanol 2-Hydroxypropylamine Isopropanolamine	Thick liquid      Colorless      Slight ammonia odor  Floats and mixes with water. Freezing point is 35°F.
Avoid contact with liquid. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, water, alcohol foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{NH}_2$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 78-96-6
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51461

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full face shield; goggles; eye wash facility.
- 3.2 **Symptoms Following Exposure:** Vapor irritates eyes and nose. Liquid causes local injury to mouth, throat, digestive tract, skin, and eyes.
- 3.3 **Treatment of Exposure:** INGESTION: induce vomiting by giving large volumes of warm salt water (2 tablespoons per glass); call a doctor. EYES: flush with water for at least 15 min. and call a doctor. SKIN: flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 165°F O.C. 171°F C.C.
- 4.2 **Flammable Limits in Air:** 2.2% (calc.)–12% (est.)
- 4.3 **Fire Extinguishing Agents:** Dry chemical, water spray, alcohol foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors generated when heated.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 706°F (est.)
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 1.1 mm/min
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 27.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** (theor.) 5.1%, 5 days; 46%, 20 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 2  
 Human Oral hazard: 1  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98.5+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 75.11
- 9.3 **Boiling Point at 1 atm:** 320°F = 160°C = 433°K
- 9.4 **Freezing Point:** 35.4°F = 1.9°C = 275.1°K
- 9.5 **Critical Temperature:** 622.4°F = 328°C = 601.2°K
- 9.6 **Critical Pressure:** 850 psia = 58 atm = 5.9 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.961 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** 272 Btu/lb = 151 cal/g =  $6.32 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** (est.) –13,900 Btu/lb = –7,700 cal/g =  $-322 \times 10^5$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) –17 Btu/lb = –10 cal/g =  $-0.4 \times 10^5$  J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.05 psia

### NOTES

# MONOISOPROPANOLAMINE

MPA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	60.470	52	0.671		N		N
60	60.190	54	0.672		O		O
70	59.910	56	0.673		T		T
80	59.620	58	0.674				
90	59.340	60	0.675		P		P
100	59.050	62	0.677		E		E
110	58.770	64	0.678		R		R
120	58.480	66	0.679		T		T
130	58.200	68	0.680		I		I
140	57.920	70	0.681		N		N
150	57.630	72	0.682		E		E
160	57.350	74	0.683		N		N
170	57.060	76	0.684		T		T
180	56.780	78	0.685				
190	56.490	80	0.687				
200	56.210	82	0.688				
210	55.930	84	0.689				
		86	0.690				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	60	0.009	60	0.00012		N
	I	70	0.014	70	0.00018		O
	S	80	0.020	80	0.00026		T
	C	90	0.030	90	0.00038		
	I	100	0.044	100	0.00055		P
	B	110	0.063	110	0.00077		E
	L	120	0.089	120	0.00108		R
	E	130	0.125	130	0.00149		T
		140	0.174	140	0.00203		I
		150	0.238	150	0.00273		N
		160	0.323	160	0.00365		E
		170	0.435	170	0.00483		N
		180	0.580	180	0.00634		N
		190	0.765	190	0.00824		T
		200	1.002	200	0.01063		
		210	1.302	210	0.01360		
		220	1.678	220	0.01728		
		230	2.148	230	0.02179		
		240	2.729	240	0.02729		
		250	3.444	250	0.03396		
		260	4.318	260	0.04199		
		270	5.382	270	0.05161		
		280	6.667	280	0.06306		
		290	8.212	290	0.07664		
		300	10.060	300	0.09265		

# MAGNESIUM PERCHLORATE

MPC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Anhydrous Dehydrate Magnesium perchlorate, anhydrous Magnesium perchlorate hexahydrate	Solid  White  Odorless  Sinks and mixes with water.
<b>Evacuate.</b> <b>Keep people away. Avoid contact with solid and dust.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. Will increase the intensity of a fire. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $Mg(ClO_4)_2$   
2.3 IMO/UN Designation: 5.1/1475  
2.4 DOT ID No.: 1475  
2.5 CAS Registry No.: 10034-81-8  
2.6 NAERG Guide No.: 140  
2.7 Standard Industrial Trade Classification: 52339

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** U.S. Bu. Mines approved respirator; chemical safety goggles; face shield  
3.2 **Symptoms Following Exposure:** Inhalation of dust irritates mucous membranes. Ingestion of large amounts may be fatal; immediate symptoms include abdominal pains, nausea and vomiting, diarrhea, pallor, blueness, shortness of breath, unconsciousness. Contact with eyes or skin causes irritation.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; get medical attention if irritation persists. INGESTION: give large amount of water; induce vomiting; call a physician. EYES: flush with copious quantities of water for at least 15 min.; call physician. SKIN: flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable, but may cause or increase the intensity of a fire  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Can form explosive mixture with combustible material or finely powdered metals. Increases the intensity of fires.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves with liberation of heat. May cause spattering.  
5.2 **Reactivity with Common Materials:**  
Contact with wood, paper, oils, grease, or finely divided metals may cause fires and explosions.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure anhydrous; 65-68% solution of hexahydrate in water.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer  
8.2 49 CFR Class: 5.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	0
Instability (Yellow).....	0
Special (White).....	OX

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 223.2  
9.3 **Boiling Point at 1 atm:** Decomposes above 250°C  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 2.21 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** -260 Btu/lb = -140 cal/g = -6.0 X 10<sup>6</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# MAGNESIUM PERCHLORATE

MPC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	91.919		N		N		N
36	92.339		O		O		O
38	92.770		T		T		T
40	93.190						
42	93.610		P		P		P
44	94.030		E		E		E
46	94.450		R		R		R
48	94.879		T		T		T
50	95.299		I		I		I
52	95.719		N		N		N
54	96.139		E		E		E
56	96.570		N		N		N
58	96.990		E		E		E
60	97.410		N		N		N
62	97.830		T		T		T
64	98.250						
66	98.679						
68	99.099						
70	99.520						
72	99.940						
74	100.400						
76	100.799						
78	101.200						
80	101.599						
82	102.099						
84	102.500						

# METHYL PHOSPHONOTHIOIC DICHLORIDE

MPD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> MPTD	Liquid  Colorless  Sharp Unpleasant Odor  Sinks and mixes violently with water.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Irritating gases may be produced when heated. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OF FOAM ON FIRE. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CH<sub>2</sub>PSCl<sub>2</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 1760  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Use extreme care when handling this compound. Avoid any contact with liquid or vapor. Rubber or neoprene gloves; respiratory protection; goggles
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat; effects are quite similar to those of phosgene. Ingestion causes irritation of mouth and stomach. Delayed, painful eye irritation may occur from exposure to vapor; liquid causes severe irritation. Contact with skin causes irritation and burns.
- 3.3 **Treatment of Exposure:** Get medical attention after all exposures to this compound. INHALATION: remove victim to fresh air; alert physician to delayed effects similar to those of phosgene. INGESTION: give large amount of water and induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** >122°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam  
4.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride, sulfur dioxide and other fumes may be formed in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 16.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with water to form hydrochloric acid and/or hydrogen chloride vapor. The reaction may be violent.  
5.2 **Reactivity with Common Materials:** Corrosive to metals because of its high acidity  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute sodium bicarbonate or soda ash solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** Currently not available  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 149  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** -14.1°F = -25.6°C = 247.6°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.42 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** (est.) 110 Btu/lb = 60 cal/g = 2.5 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL PHOSPHONOTHIOIC DICHLORIDE

MPD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	88.639		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S	60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140	0.043 0.053 0.063 0.076 0.091 0.108 0.128 0.151 0.178 0.208 0.242 0.282 0.326 0.376 0.433 0.496 0.567	60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140	0.00116 0.00139 0.00166 0.00198 0.00234 0.00276 0.00324 0.00378 0.00441 0.00511 0.00591 0.00680 0.00781 0.00893 0.01019 0.01158 0.01313		N O T  P E R T I N E N T



# 2-METHYL-1-PENTENE

MPE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> iso-Hexene 2-Methyl pentene-1 4-Methyl-4-pentene 1-Methyl-1-propylethylene	Liquid  Colorless  Floats on water. Flammable, irritating vapor is produced.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR If inhaled, will cause dizziness difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_2\text{C}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{CH}_3$   
2.3 IMO/UN Designation: 3.1/2288  
2.4 DOT ID No.: 2288  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber or neoprene gloves, splash goggles and NIOSH approved self-contained breathing apparatus.  
3.2 **Symptoms Following Exposure:** INHALATION: May produce anesthetic effects. EYES: Moderate eye irritation possible.  
3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from contaminated atmosphere. If respiration is labored, administer oxygen. If unconscious, administer artificial respiration. EYES: Flush with clear tap water for 15 min. SKIN: Wash with soap and water. INGESTION: Do not induce vomiting. Physician may remove by cuffed tube lavage.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
-15°F (est.).  
4.2 **Flammable Limits in Air:** 1.2%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Can react vigorously with oxidizing materials.  
4.7 **Auto Ignition Temperature:** 572°F.  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
100-1000 ppm/96 hr/finfish/TL<sub>50</sub>.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Theoretical Oxygen Demand-1.0% after 6 hrs., 1.1% after 12 hrs., 1.7% after 24 hrs.  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: (1)  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.9% with .1% isoolefins (Research). 99.8% with .1% isoolefins and .1% trans-4-Methylpentene-2 (pure). 95.8% (Tech). 95.0% Minimum.  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 84.156.  
9.3 **Boiling Point at 1 atm:** 143.8°F, 62°C, 355.2°K.  
9.4 **Freezing Point:** -212.3°F, -135.8°C, 137.4°K.  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.685 at 15°C.  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 2.9.  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.067.  
9.12 **Latent Heat of Vaporization:** 144.1 Btu/lb = 79.96 cal/g = 3.35 X 10<sup>6</sup> J/kg.  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2-METHYL-1-PENTENE

MPE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	42.640		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	100	6.300		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# 4-METHYLPYRIDINE

MPF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 4-Picoline gamma-Picoline p-Picoline UN 2313 (DOT)	Liquid  Water soluble liquid.	Colorless to brown  Obnoxious, sweetish odor
<b>Fire</b> COMBUSTIBLE. Vapor may explode if ignited in an enclosed area. Wear chemical protective suit with self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b> CALL FOR MEDICAL AID  VAPOR Poisonous if inhaled or if skin is exposed. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Poisonous if swallowed or if skin is exposed. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b> Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 9; Aromatic amines 2.2 Formula: C <sub>5</sub> H <sub>5</sub> N 2.3 IMO/UN Designation: 3.3/2313 2.4 DOT ID No.: 2313 2.5 CAS Registry No.: 108-89-4 2.6 NAERG Guide No.: 130 2.7 Standard Industrial Trade Classification: 51577
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Wear self-contained breathing apparatus, rubber boots, heavy rubber gloves, and protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Harmful if swallowed, inhaled or absorbed through the skin. Causes severe irritation. High concentrations are extremely destructive to tissues of the mucous membranes and upper respiratory tract, eyes and skin. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, vomiting and gastrointestinal disturbances. 3.3 <b>Treatment of Exposure:</b> INHALATION: CALL FOR MEDICAL AID. Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with copious amounts of water for at least 15 minutes. Assure adequate flushing of the eyes by separating eyelids with fingers. SKIN: Flush with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 1.29 g/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Causes damage to the liver and kidney. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 3.11 <b>Liquid or Solid Characteristics:</b> Severe skin irritant. Causes second and third degree burns on short exposure and is very injurious to the eyes. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 134°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Emits toxic fumes under fire conditions. Forms explosive mixture in air.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 1000°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 41.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water.  
5.5 **Polymerization:** Not pertinent.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 93.13  
9.3 **Boiling Point at 1 atm:** 293°F = 145°C = 418.2°K  
9.4 **Freezing Point:** 36.3°F = 2.4°C = 275.6°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.957  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.2  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# 4-METHYLPYRIDINE

MPF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E	68	0.077		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.233 0.246 0.259 0.271 0.283 0.295 0.307 0.319 0.330 0.341 0.352 0.363 0.374 0.384 0.394 0.404 0.414 0.424 0.433 0.443 0.452 0.461 0.469 0.478 0.486

# METHYL ISOPROPENYL KETONE

MPK

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isopropenyl methyl ketone 2-Methyl-1-butene-3-one	Liquid  Colorless  Sweet pleasant odor  Floats on water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Combat fires from safe distance or protected location. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{COC}(\text{CH}_3)=\text{CH}_2$   
2.3 IMO/UN Designation: 3.2/1246  
2.4 DOT ID No.: 1246  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 127P  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Liquid may cause severe damage to eyes, resulting possibly in some permanent impairment of vision; vapor produces tears. If not removed promptly from skin, liquid may cause delayed pain and blistering. Ingestion causes irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; give artificial respiration if needed; call physician. EYES: immediately irrigate with copious amounts of water for 15 min.; call physician. SKIN: wash off skin with large volumes of water for 15 min.; call physician if burn has occurred. INGESTION: induce vomiting; call physician.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral  $\text{LD}_{50} = 180 \text{ mg/kg}$  (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Causes smarting and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  $<73^\circ\text{F}$  C.C.  
4.2 **Flammable Limits in Air:** 1.8%-9.0%  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** May polymerize and explode.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 4.7 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Will polymerize in the absence of inhibitor, especially when heated.  
5.6 **Inhibitor of Polymerization:** Up to 1% hydroquinone

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	-
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at  $15^\circ\text{C}$  and 1 atm:** Liquid  
9.2 **Molecular Weight:** 84.1  
9.3 **Boiling Point at 1 atm:**  $208^\circ\text{F} = 98^\circ\text{C} = 371^\circ\text{K}$   
9.4 **Freezing Point:**  $-65^\circ\text{F} = -54^\circ\text{C} = 219^\circ\text{K}$   
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.85 at  $20^\circ\text{C}$  (liquid)  
9.8 **Liquid Surface Tension:** (est.) 26 dynes/cm = 0.026 N/m at  $20^\circ\text{C}$   
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at  $20^\circ\text{C}$   
9.10 **Vapor (Gas) Specific Gravity:** 2.9  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0796 at  $20^\circ\text{C}$  ( $68^\circ\text{F}$ )  
9.12 **Latent Heat of Vaporization:** (est.) 182 Btu/lb = 101 cal/g =  $4.23 \times 10^5 \text{ J/kg}$   
9.13 **Heat of Combustion:** (est.)  $-15,500 \text{ Btu/lb} = -8,600 \text{ cal/g} = -360 \times 10^5 \text{ J/kg}$   
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** (est.)  $-380 \text{ Btu/lb} = -210 \text{ cal/g} = -8.8 \times 10^5 \text{ J/kg}$   
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL ISOPROPENYL KETONE

MPK

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	54.240	52	0.471	60	1.048	60	0.880
36	54.170	54	0.472	61	1.048	61	0.872
38	54.100	56	0.473	62	1.048	62	0.865
40	54.030	58	0.474	63	1.048	63	0.857
42	53.960	60	0.476	64	1.048	64	0.850
44	53.890	62	0.477	65	1.048	65	0.842
46	53.820	64	0.478	66	1.048	66	0.835
48	53.750	66	0.479	67	1.048	67	0.828
50	53.680	68	0.480	68	1.048	68	0.821
52	53.610	70	0.481	69	1.048	69	0.814
54	53.540	72	0.482	70	1.048	70	0.807
56	53.470	74	0.483	71	1.048	71	0.800
58	53.410	76	0.484	72	1.048	72	0.794
60	53.340	78	0.486	73	1.048	73	0.787
62	53.270	80	0.487	74	1.048	74	0.780
64	53.200	82	0.488	75	1.048	75	0.774
66	53.130	84	0.489	76	1.048	76	0.768
68	53.060	86	0.490	77	1.048	77	0.761
70	52.990						
72	52.920						
74	52.850						
76	52.780						
78	52.710						
80	52.640						
82	52.570						
84	52.500						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	0.519	60	0.00782	0	0.288
	N	70	0.689	70	0.01020	20	0.298
	S	80	0.906	80	0.01316	40	0.307
	O	90	1.179	90	0.01681	60	0.317
	L	100	1.521	100	0.02129	80	0.326
	U	110	1.943	110	0.02672	100	0.335
	B	120	2.462	120	0.03327	120	0.344
	L	130	3.094	130	0.04111	140	0.353
	E	140	3.860	140	0.05043	160	0.361
		150	4.780	150	0.06142	180	0.370
		160	5.878	160	0.07432	200	0.378
		170	7.182	170	0.08936	220	0.387
		180	8.720	180	0.10680	240	0.395
		190	10.520	190	0.12690	260	0.403
		200	12.630	200	0.15000	280	0.411
		210	15.070	210	0.17630	300	0.419
						320	0.426
						340	0.434
						360	0.441
						380	0.448
						400	0.456
						420	0.463
						440	0.470
						460	0.476
						480	0.483
						500	0.490

# MORPHOLINE

MPL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diethyleneimide oxide Diethylene imidoxide Diethylene oximide Tetrahydro-2h-1, 4-oxazine Tetrahydro-p-oxazine	<b>Physical Description</b> Oily liquid Colorless Fishy, ammonia odor  Floats and mixes with water. Irritating vapor is produced.
<b>First Aid</b> Avoid contact with liquid and vapor. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	<b>Fire Hazards</b> FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with water, dry chemical, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	<b>Exposure Hazards</b> CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, headache, or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	<b>Environmental Hazards</b> Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amine  
2.2 Formula:  $\text{OCH}_2\text{CH}_2\text{NHCH}_2\text{CH}_2$   
2.3 IMO/UN Designation: 3.3/2054  
2.4 DOT ID No.: 2054  
2.5 CAS Registry No.: 110-91-8  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51579

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor canister or self-contained breathing apparatus; rubber boots and gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Liquid causes skin and eye burns. Breathing vapors or absorption through skin may cause nausea and headache.  
3.3 **Treatment of Exposure:** INHALATION: if ill effects occur, move patient to fresh air, keep him quiet and warm, and call a physician; if breathing stops, start artificial respiration. INGESTION: force milk or water, then immediately induce vomiting; treat symptomatically; no known antidote. SKIN OR EYES: immediately flush with plenty of water for at least 15 min.; for eyes get medical attention promptly.  
3.4 **TLV-TWA:** 20 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2:  $\text{LD}_{50}$  = 0.5 to 5 g/kg (guinea pig, rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.01 ppm  
3.13 **IDLH Value:** 1,400 ppm  
3.14 **OSHA PEL-TWA:** 20 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 100°F O.C.  
4.2 **Flammable Limits in Air:** 1.8%-10.8%  
4.3 **Fire Extinguishing Agents:** Water fog, alcohol foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel some distance to source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 590°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 1.9 mm/min  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 32.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** (theor.) 0.9%, 5 days; 5.1%, 20 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Several grades available, most above 99%.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 87.12  
9.3 **Boiling Point at 1 atm:** 262.8°F = 128.2°C = 401.4°K  
9.4 **Freezing Point:** 23.4°F = -4.8°C = 268.4°K  
9.5 **Critical Temperature:** 653.0°F = 345°C = 618.2°K  
9.6 **Critical Pressure:** 794 psia = 54 atm = 5.47 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.00 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.091  
9.12 **Latent Heat of Vaporization:** 182.9 Btu/lb = 101.6 cal/g = 4.254 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.55 psia

### NOTES

# MORPHOLINE

MPL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	63.740	70	0.476		N		N
40	63.550	75	0.477		O		O
45	63.360	80	0.479		T		T
50	63.170	85	0.480				
55	62.980	90	0.481		P		P
60	62.790	95	0.482		E		E
65	62.600	100	0.484		R		R
70	62.410	105	0.485		T		T
75	62.220	110	0.486		I		I
80	62.030	115	0.488		N		N
85	61.840	120	0.489		E		E
90	61.650	125	0.490		N		N
95	61.450	130	0.492		T		T
100	61.260	135	0.493				
105	61.070	140	0.494				
110	60.880	145	0.496				
115	60.690	150	0.497				
120	60.500	155	0.498				
		160	0.499				
		165	0.501				
		170	0.502				
		175	0.503				
		180	0.505				
		185	0.506				
		190	0.507				
		195	0.509				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	-30	0.002	-30	0.00003	50	0.274
	I	-20	0.003	-20	0.00005	52	0.274
	S	-10	0.005	-10	0.00009	54	0.274
	C	0	0.008	0	0.00014	56	0.274
	I	10	0.013	10	0.00023	58	0.274
	B	20	0.021	20	0.00036	60	0.274
	L	30	0.033	30	0.00054	62	0.274
	E	40	0.049	40	0.00080	64	0.274
		50	0.073	50	0.00117	66	0.274
		60	0.106	60	0.00166	68	0.274
		70	0.152	70	0.00232	70	0.274
		80	0.213	80	0.00320	72	0.274
		90	0.294	90	0.00434	74	0.274
		100	0.401	100	0.00581	76	0.274
		110	0.538	110	0.00767	78	0.274
		120	0.714	120	0.00999	80	0.274
		130	0.936	130	0.01288	82	0.274
		140	1.213	140	0.01641	84	0.274
		150	1.556	150	0.02071		
		160	1.976	160	0.02588		
		170	2.487	170	0.03205		
		180	3.102	180	0.03936		
		190	3.838	190	0.04795		
		200	4.712	200	0.05797		
		210	5.742	210	0.06959		
		220	6.949	220	0.08297		



# 2-METHYLPYRIDINE

MPR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> alpha-Methylpyridine Picoline 2-Picoline alpha-Picoline	Liquid  Colorless  Strong, unpleasant  Floats on water. Poisonous, flammable vapor is produced.
<b>Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Poisonous gases are produced when heated. Flashback along vapor trail may occur. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Harmful if inhaled or if skin is exposed. Irritating to eyes, nose, and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed or if skin is exposed. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is UNCONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim in UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_5H_7N$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2313  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51577

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear goggles, rubber gloves, self-contained breathing apparatus and protective overclothing.
- 3.2 **Symptoms Following Exposure:** INHALATION, INGESTION OR SKIN ABSORPTION: Narcosis, headache, nausea, giddiness, vomiting. EYES: Severe irritation. SKIN: Causes burns. INGESTION: Irritation and gastric upset.
- 3.3 **Treatment of Exposure:** Get medical aid. INHALATION: Remove from exposure. Give artificial respiration and oxygen as needed. EYES: Flush with running water for at least 15 min. SKIN: Remove contaminated clothing. Wash with soap and water. INGESTION: Induce vomiting, follow with gastric lavage.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50}$  = -5-5 g/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Chronic exposure may cause occasional vomiting and diarrhea; weight loss and anemia; ocular and facial paralysis. Kidney and liver injury have been reported.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** 0.046 ppm-100% recognition in air. 0.023 ppm-50% recognition in air. 0.5-1.0 ppm-can be detected in water.
- 3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 95°F O.C.  
: 79°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical or "alcohol" foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** When heated to decomposition, emits toxic fumes of cyanide.
- 4.6 **Behavior in Fire:** Heat may cause pressure buildup in closed containers. Use water to keep container cool.
- 4.7 **Auto Ignition Temperature:** 1000°F.
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 41.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Can react with oxidizing materials.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Theoretical oxygen demands = 2.75.
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** alpha-Picoline 98%, Water 0.2% max.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** U191
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 93.13.
- 9.3 **Boiling Point at 1 atm:** 263.8°F = 128.8°C = 401.95°K.
- 9.4 **Freezing Point:** -88.24°F = -66.8°C = 206.35°K.
- 9.5 **Critical Temperature:** 658.4°F = 348°C = 621.2°K.
- 9.6 **Critical Pressure:** (est.) 614.3 psia = 41.8 atm = 4.23 MN/m<sup>2</sup>.
- 9.7 **Specific Gravity:** 0.944 at 20°C.
- 9.8 **Liquid Surface Tension:** (est.) 33.2 dynes/cm = 0.0332 N/m at 20°C.
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 3.2.
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** >1, approx. 1.123.
- 9.12 **Latent Heat of Vaporization:** (est. at boiling point) 160.4 Btu/lb = 98.1 cal/g = 3.7 X 10<sup>5</sup> J/kg.
- 9.13 **Heat of Combustion:** Net at 25°C. -15089 Btu/lb = -8383 cal/g = -350.7 X 10<sup>5</sup> J/kg.
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2-METHYLPYRIDINE

MPR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
59	59.306	80	0.434		C		C
60	59.266	90	0.434		U		U
61	59.227	100	0.434		R		R
62	59.187	110	0.434		R		R
63	59.148	120	0.434		E		E
64	59.108	130	0.434		N		N
65	59.069	140	0.434		T		T
66	59.029	150	0.434		L		L
67	58.990	160	0.434		Y		Y
68	58.950	170	0.434				
		180	0.434		N		N
		190	0.434		O		O
		200	0.434		T		T
		210	0.434				
		220	0.434		A		A
		230	0.434		V		V
		240	0.434		A		A
		250	0.434		I		I
					L		L
					A		A
					B		B
					L		L
					E		E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	20	-1.203	60	0.00056	1350	0.623
	I	40	-0.227	70	0.00104	1375	0.626
	S	60	0.750	80	0.00176	1400	0.630
	C	80	0.274	90	0.00282	1425	0.634
	I	100	1.297	100	0.00429	1450	0.637
	B	120	2.321	110	0.00626	1475	0.641
	L	140	3.344	120	0.00886	1500	0.644
	E	160	4.368	130	0.01218	1525	0.648
		180	5.391	140	0.01635	1550	0.651
		200	6.415	150	0.02151	1575	0.654
		220	7.438	160	0.02781	1600	0.658
		240	8.462	170	0.03539	1625	0.661
		260	9.485	180	0.04443	1650	0.664
				190	0.05509	1675	0.667
				200	0.06756	1700	0.671
				210	0.08203	1725	0.674
				220	0.09870	1750	0.677
				230	0.11779	1775	0.680
				240	0.13952	1800	0.683
				250	0.16412	1825	0.686
				260	0.19183	1850	0.689
						1875	0.692
						1900	0.695
						1925	0.698
						1950	0.701
						1975	0.704

# METHYL PARATHION

MPT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Alkron O,O-Dimethyl o-p-nitrophenyl thiophosphate Metron MPT Niran Parathion-methyl Paridol Wolfatox	Solid crystals  White solid or brown liquid  Rotten eggs or garlic odor  Solid and liquid sink in water, solution floats on water. Melting (freezing) point is 65°F.
<b>Evacuate.</b> <b>Keep people away. AVOID CONTACT WITH LIQUID.</b> Wear chemical protective suit with self-contained breathing apparatus. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED. Containers may explode in fire. Wear chemical protective suit with self-contained breathing apparatus. Combat fires from safe distance or protected location. Extinguish with water. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CON- VULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Solution is fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (CH<sub>3</sub>O)<sub>2</sub>PSOC-HNO<sub>2</sub>-p  
2.3 IMO/UN Designation: 6.1/2783  
2.4 DOT ID No.: 2783  
2.5 CAS Registry No.: 298-00-0  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification:  
51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved mask or respirator; natural rubber gloves, overshoes; protective clothing; goggles.
- 3.2 **Symptoms Following Exposure:** Exposure to fumes from a fire, or to the liquid, causes headache, blurred vision, constricted pupils of the eyes, weakness, nausea, cramps, diarrhea, and tightness in the chest. Muscle twitch and convulsions may follow. Symptoms may develop over a period of 8 hrs.
- 3.3 **Treatment of Exposure:** Speed is essential. INGESTION: call a doctor. If victim is not breathing, immediately institute artificial respiration by mouth-to-mouth, mouth-to-nose, or mouth-to-oropharyngeal method; when victim is conscious, give milk, water, or salt-water and induce vomiting repeatedly. SKIN OR EYES: flood and wash exposed areas thoroughly with water; remove contaminated clothing under a shower.
- 3.4 **TLV-TWA:** 0.2 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> below 50 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Poisonous when absorbed through skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 115°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic gases are produced in fires.  
4.6 **Behavior in Fire:** Drums may rupture violently.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 59.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 15.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Half decomposed in 8 days at 40°C  
5.2 **Reactivity with Common Materials:** Is absorbed in wood, etc., which must be replaced to eliminate poison hazard.  
5.3 **Stability During Transport:** Decomposes above 50°C with possible explosive force.  
5.4 **Neutralizing Agents for Acids and Caustics:** Apply caustic or soda ash slurry until yellow stains disappear.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.9 ppm/96 hr/bluegill/TL<sub>w</sub>/fresh water  
8.3 ppm/96 hr/fathead/TL<sub>w</sub>/fresh water  
6.2 **Waterfowl Toxicity:** LD<sub>50</sub> = 10 mg/kg  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure (solid); technical (liquid); 80% in xylene  
7.2 **Storage Temperature:** Below 50°F  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	4 4
Flammability (Red).....	3 1
Instability (Yellow).....	2 2

8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** P071  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 263.2  
9.3 **Boiling Point at 1 atm:** Very high  
9.4 **Freezing Point:** 65°F = 18°C = 291°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.360 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL PARATHION

MPT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	84.770	85	0.365		N	68	5.770
69	84.770	90	0.365		O	69	5.623
70	84.770	95	0.365		T	70	5.481
71	84.770	100	0.365			71	5.342
72	84.770	105	0.365		P	72	5.207
73	84.770	110	0.365		E	73	5.077
74	84.770	115	0.365		R	74	4.950
75	84.770	120	0.365		T	75	4.826
76	84.770	125	0.365		I	76	4.707
77	84.770	130	0.365		N	77	4.590
78	84.770	135	0.365		E	78	4.477
79	84.770	140	0.365		N	79	4.367
80	84.770	145	0.365		T	80	4.260
81	84.770	150	0.365			81	4.156
82	84.770					82	4.056
83	84.770					83	3.957
84	84.770					84	3.862
85	84.770					85	3.769

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.002		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T

# 1-METHYLPYRROLIDONE

MPY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Methyl-2-pyrrolidinone N-Methylpyrrolidinone N-Methylpyrrolidone N-Methyl-alpha-pyrrolidone	Liquid	White	Mild Fishy odor
May float or sink in water.			
Keep people away. Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: C<sub>4</sub>H<sub>7</sub>NO
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 872-50-4
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51628

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Inhalation of hot vapors can irritate nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation. Repeated and prolonged skin contact produces a mild, transient irritation.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water and induce vomiting. EYES: flush with water for at least 15 min. SKIN: remove from skin and eyes by flooding the affected tissues with water; wash with soap and water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; oral LD<sub>50</sub> = 3.5 mg/kg (rabbit)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Causes blood abnormalities in rats
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 204°F O.C.
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Dry chemical, "alcohol" foam, carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
- 4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may be formed in fire.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 36.9 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 10.5 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 1
  - Human Oral hazard: 0
  - Human Contact hazard: 0
  - Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open (flame arrester)
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 99
- 9.3 Boiling Point at 1 atm: 396°F = 202°C = 475°K
- 9.4 Freezing Point: 1°F = -17°C = 256°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.03 at 25°C (liquid)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: 3.4
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: -13,000 Btu/lb = -7,220 cal/g = -302 X 10<sup>3</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# 1-METHYLPYRROLIDONE

MPY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	64.849		N O T		N O T		N O T
54	64.780						
56	64.709						
58	64.639						
60	64.570		P		P		P
62	64.500		E		E		E
64	64.429		R		R		R
66	64.360		T		T		T
68	64.290		I		I		I
70	64.230		N		N		N
72	64.160		E		E		E
74	64.089		N		N		N
76	64.020		T		T		T
78	63.950						
80	63.880						
82	63.810						
84	63.740						
86	63.670						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T		N O T		N O T
			P		P		P
			E		E		E
			R		R		R
			T		T		T
			I		I		I
			N		N		N
			E		E		E
			N		N		N
			T		T		T

# MERCURIC CHLORIDE

MRC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Calochlor Corrosive mercury chloride Mercury bichloride Mercury (II) chloride Mercury perchloride	Solid  White   Sinks and mixes slowly with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear a dust respirator and rubber overclothing (including gloves). Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:** HgCl<sub>2</sub>
- 2.3 **IMO/UN Designation:** 6.1/1624
- 2.4 **DOT ID No.:** 1624
- 2.5 **CAS Registry No.:** 7487-94-7
- 2.6 **NAERG Guide No.:** 154
- 2.7 **Standard Industrial Trade Classification:** 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Bu. Mines approved airline respirator; impervious suit; appropriate eye protection
- 3.2 **Symptoms Following Exposure:** All forms of exposure to this compound are hazardous; acute systemic mercurialism may be fatal within a few minutes, but death by uremic poisoning is usually delayed 5-12 days. Acute poisoning has resulted from inhaling dust concentrations of 1.2-8.5 mg/m<sup>3</sup> of air; symptoms include tightness and pain in chest, coughing, and difficulty in breathing. Ingestion causes necrosis, pain, vomiting, and severe purging; as little as 0.5 gm can be fatal. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin.
- 3.3 **Treatment of Exposure:** Act promptly] Alimentary absorption is very rapid, and the first 10-15 minutes determine the prognosis. INHALATION: remove victim to fresh air; get medical attention. INGESTION: give egg whites, milk, or activated charcoal; induce vomiting; consult physician. EYES or SKIN: wash with water for 15 min.
- 3.4 **TLV-TWA:** 0.025 mg/m<sup>3</sup> (as mercury)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; oral LD<sub>50</sub> = 1 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** 0.1 mg/m<sup>3</sup> (as mercury)
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
**Products:** Heat of fire may cause material to form fumes of mercuric chloride, which are toxic.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.82 ppm/7 days/goldfish/TLW/fresh water  
0.075 ppm/48 hr/pink shrimp/TLW/salt water  
4.2 ppm/48 hr/oyster/TLW/sea water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Many organisms are capable of accumulating mercury from water.  
Bioconcentrative up to 10,000-fold.
- 6.5 **GESAMP Hazard Profile:**  
**Bioaccumulation:** +  
**Damage to living resources:** B4  
**Human Oral hazard:** 4  
**Human Contact hazard:** II  
**Reduction of amenities:** XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent; Analytical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 271.50
- 9.3 **Boiling Point at 1 atm:** 576°F = 302°C = 575°K
- 9.4 **Freezing Point:** 531°F = 277°C = 550°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 5.4 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 15.3 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# MERCURIC CHLORIDE

MRC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	3.666		N O T		N O T		N O T
36	3.833						
38	4.000						
40	4.166						
42	4.333		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	4.500						
46	4.666						
48	4.833						
50	5.000						
52	5.166						
54	5.333						
56	5.500						
58	5.666						
60	5.833						
62	6.000						
64	6.166						
66	6.333						
68	6.500						
70	6.666						
72	6.833						
74	7.000						
76	7.166						
78	7.333						
80	7.500						
82	7.666						
84	7.833						



# MYRCENE

MRE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 3-Methylene-7-methyl 1,6-octadiene 2-Methyl-6-methylene-2,7-octadiene 1,6-Octadiene, 7-methyl-3-methylene	Oil	Yellow tinted	Pleasant odor
<b>Call fire department.</b> <b>Avoid contact with liquid.</b> <b>Evacuate area.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b>			
<b>Fire</b>	Combustible. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with water, dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 30; Olefins  
2.2 **Formula:**  
H2CCHC(=CH2)CH2CH2CH=C(CH3)2  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 123-35-3  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion or skin absorption.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing give artificial respiration. If breathing is difficult give oxygen. SKIN: Wash with soap and copious amounts of water. EYES: Immediately flush with copious amounts of water. Insure adequate flushing of the eyes by holding the eyelids open with the fingers.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 103°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray, carbon dioxide, dry chemical, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Vapor may travel considerable distance to a source of ignition and flashback.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 66.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Ambient  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 136.24  
9.3 **Boiling Point at 1 atm:** 332.6°F = 167°C = 440.2°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.801  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.7  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.0891 psia

### NOTES

# MYRCENE

MRE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	58 68 128 153 181 199 223 259 299 341	0.019 0.135 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.314 0.328 0.342 0.356 0.369 0.383 0.396 0.408 0.421 0.433 0.445 0.457 0.468 0.479 0.491 0.501 0.512 0.522 0.533 0.543 0.552 0.562 0.571 0.581 0.590

# MERCUROUS NITRATE

MRN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Mercurous nitrate monohydrate Mercury protonitrate	Solid  White  Slight odor  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear dust respirator and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{HgNO}_3 \cdot \text{H}_2\text{O}$   
2.3 IMO/UN Designation: 6.1/1627  
2.4 DOT ID No.: 1627  
2.5 CAS Registry No.: 10415-75-5  
2.6 NAERG Guide No.: 141  
2.7 Standard Industrial Trade Classification: 52359

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves  
3.2 **Symptoms Following Exposure:** Acute systemic poisoning may be fatal within a few minutes; death by uremic poisoning is usually delayed 5-12 days. Acute poisoning has resulted from inhaling dust concentrations of 1.2-8.5  $\text{mg/m}^3$  of air; symptoms include tightness and pain in chest, coughing, and difficulty in breathing. Ingestion causes necrosis, pain, vomiting, and severe purging. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; get medical attention. INGESTION: give egg whites, milk, or activated charcoal; induce vomiting; consult physician. EYES: flush with water for at least 15 min. SKIN: flush with water.  
3.4 **TLV-TWA:** 0.025  $\text{mg/m}^3$  (as mercury)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral  $\text{LD}_{50}$  = 297  $\text{mg/kg}$  (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 0.1  $\text{mg/m}^3$  (as mercury)  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable, but may intensify fire.  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Smoke from fire may contain toxic mercury vapor and oxides of nitrogen.  
4.6 **Behavior in Fire:** May increase intensity of fire  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves, then forms cloudy acid solution. The reaction is not hazardous.  
5.2 **Reactivity with Common Materials:** Solution may corrode most metals. Solid in contact with wood or paper may cause fire.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Possible bioaccumulation problem. Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent; Purified  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 280.6  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 4.78 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# MERCUROUS NITRATE

MRN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# MERCUROUS CHLORIDE

MRR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Calomel Mercury monochloride Mercury protochloride Mercury subchloride Mild mercury chloride	Solid  White  Odorless  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear dust respirator. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: HgCl or Hg<sub>2</sub>Cl<sub>2</sub>
- 2.3 IMO/UN Designation: 6.1/2025
- 2.4 DOT ID No.: 2025
- 2.5 CAS Registry No.: 7546-30-7
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves
- 3.2 **Symptoms Following Exposure:** Acute poisoning can result from inhaling dust concentrations of 1.2-8.5 mg/m<sup>3</sup> in air; symptoms include pain and tightness in chest, coughing, and difficulty in breathing. Compound is an irritant, cathartic, or purgative; rarely, "calomel sickness," a benign reaction with fever and rash, appears after about 1 week; seldom causes systemic poisoning but may be fatal if retained to 30-40 mg/kg. Contact with eyes causes mild irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; give artificial respiration if breathing has stopped. INGESTION: give egg whites, milk, or activated charcoal; induce vomiting; consult physician. EYES: flush with water. SKIN: wash with soap and water.
- 3.4 **TLV-TWA:** 0.025 mg/m<sup>3</sup> (as mercury)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 210 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Central nervous system effects, tremors, psychological disturbances in humans
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** 0.1 mg/m<sup>3</sup> (as mercury)
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Fumes from fire may contain toxic vapors of substance.
- 4.6 **Behavior in Fire:** Vaporizes and escapes as a sublimate
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** NF; Technical, 99.6%; Reagent
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 236.1
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 7.15 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 15.3 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# MERCUROUS CHLORIDE

MRR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# MERCURIC SULFATE

MRS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Mercury bisulfate Mercury persulfate Mercury (II) sulfate (1:1)	Solid  White  Odorless  Sinks in water.
Keep people away. Avoid contact with dust or solid. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to skin, eyes, and nose. If inhaled, will cause coughing, pain, and breathing difficulty. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{HgSO}_4$
- 2.3 IMO/UN Designation: 6.1/1645
- 2.4 DOT ID No.: 1645
- 2.5 CAS Registry No.: 7783-35-9
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 52349

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber gloves, protective clothing, rubber apron, and safety goggles.
- 3.2 **Symptoms Following Exposure:** INHALATION: Acute poisoning: Tightness in chest, breathing difficulty, coughing, and pain. EYES: Ulceration of conjunctiva and cornea. SKIN: Irritation; may cause sensitization dermatitis. INGESTION: Necrosis, pain, vomiting, severe purging. Patient may die within a few hours from peripheral vascular collapse.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove from exposure. EYES: Flush with water. SKIN: Flush with water. INGESTION: Give egg whites, milk, or activated charcoal, then induce vomiting. Consult physician.
- 3.4 **TLV-TWA:** 0.025 mg/m<sup>3</sup> as Hg.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> = 50 mg/kg.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Damaged kidney, heart, lung, and brain. Psychic and emotional disturbances; fine tremors of hands, head, lips, tongue, or jaw. Salivation, gingivitis, and digestive disturbances are common. Stomatitis is sometimes severe.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.
- 3.12 **Odor Threshold:** Odorless.
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** 0.1 mg/m<sup>3</sup> (as mercury)
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** None
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Decomposes into yellow insoluble basic sulfate and  $\text{H}_2\text{SO}_4$ .
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Will not occur
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Mercuric ions are considered highly toxic to aquatic life.  
0.004 to 0.02 mg/l Hg have been reported harmful to freshwater fish  
0.01 mg/l  $\text{HgSO}_4$  has killed minnows in 80 to 92 days.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 100%
- 7.2 **Storage Temperature:** Cool
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 296.68
- 9.3 **Boiling Point at 1 atm:** Not pertinent - decomposes
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 6.47 at room temperature
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 4.8 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# MERCURIC SULFATE

MRS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# MERCURIC THIOCYANATE

MRT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Mercuric sulfocyanate Mercuric sulfo cyanide Mercury rhodanide	Powdered solid  Sinks and mixes slowly with water.	White to tan	Odorless
<b>Keep people away. Avoid contact with solid and dust.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</b> <b>Notify local health and pollution control agencies.</b>			
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, or carbon dioxide.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to skin, eyes, and nose. If inhaled, will cause coughing, pain, and difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: Hg(SCN) <sub>2</sub> 2.3 IMO/UN Designation: 6.1/1646 2.4 DOT ID No.: 1646 2.5 CAS Registry No.: 592-85-8 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 52382
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Dust mask or self-contained breathing apparatus, when required; rubber gloves, safety or chemical goggles, disposable clothing, or rubber apron. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Acute poisoning symptoms are: Tightness in the chest, difficulty in breathing, coughing, and pain in the chest. EYES: Ulceration of conjunctiva and cornea. SKIN: Irritation, sensitization dermatitis. INGESTION: Necrosis, pain, vomiting, severe purging. Patient may die within a few hours from peripheral vascular collapse. 3.3 <b>Treatment of Exposure:</b> Get medical attention. INHALATION: Remove from exposure. EYES: Flush with water. SKIN: Wash thoroughly with water. INGESTION: Give egg white, milk, or activated charcoal, then induce vomiting. Consult physician. 3.4 TLV-TWA: 0.025 mg/m <sup>3</sup> as Hg. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Currently not available 3.8 Toxicity by Inhalation: Currently not available. 3.9 <b>Chronic Toxicity:</b> Hg vapor caused kidney, heart, lung, and brain damage in rabbits. In man - psychic and emotional disturbances. Fine tremors may affect hands, head, lips, tongue, or jaw. Salivation, gingivitis, and digestive disturbances.  3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Odorless 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> 0.1 mg/m <sup>3</sup> (as mercury) 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
>250°F
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, dry chemical, CO<sub>2</sub>
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** When heated, decomposes into mercury, nitrogen, etc., at about 165°C.
- 4.6 **Behavior in Fire:** When heated, swells up to many times its original volume.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Will not occur.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.004 to 0.02 mg/l Hg reported as harmful to freshwater fish  
48-hour TL<sub>m</sub> for marine fish is 0.29 mg/l  
LC<sub>50</sub> in aerated salt water: Prawn -0.075 mg/l Shrimp -5.7 mg/l Oyster -4.2 mg/l Cockle -9 mg/l
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: E  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 316.79
- 9.3 **Boiling Point at 1 atm:** Decomposes about 165°C
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** Approximately 4
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 10.9
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# MERCURIC THIOCYANATE

MRT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT PERTINENT		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.070		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# MIREX

MRX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dechlorane ENT 25,719 Hexachlorocyclopentadiene dimer Perchlorodihomocubane	Solid crystals White Odorless
Keep people away. AVOID CONTACT WITH SOLID. Notify local health and pollution control agencies.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID. SOLID POISONOUS IF SWALLOWED, INHALED, OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** Not listed.  
**2.2 Formula:** C<sub>10</sub>Cl<sub>2</sub>  
**2.3 IMO/UN Designation:** 6.1/1615 (>10%)  
 9/1615 (<10%)  
**2.4 DOT ID No.:** 2761  
**2.5 CAS Registry No.:** Currently not available  
**2.6 NAERG Guide No.:** 151  
**2.7 Standard Industrial Trade Classification:**  
 51136

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Currently not available  
**3.2 Symptoms Following Exposure:** INGESTION, INHALATION, OR SKIN EXPOSURE: Gas-trointestinal irritation with nausea, vomiting, and possible diarrhea. Malaise, headache, CNS excitation with tremor, paresthasias, ataxia, confusion, convulsions, and ventricular fibrillation. CNS depression and central respiratory paralysis may occur.  
**3.3 Treatment of Exposure:** Call a physician. INHALATION: If needed, administer artificial respiration. EYES: Flush thoroughly with water. SKIN: Wash thoroughly with soap and water. INGESTION: Induce emesis or perform gastric lavage. Give demulcents such as milk of magnesia or aluminum hydroxide gel and follow with a saline cathartic. Avoid fats and oils (may promote absorption) and epinephrine and related drugs (may cause ventricular fibrillation).  
**3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg.  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Chronic industrial exposure has caused apparently irreversible nerve damage. Has produced liver cancer in mice. Some teratogenic effects noted.  
**3.10 Vapor (Gas) Irritant Characteristics:** Not pertinent  
**3.11 Liquid or Solid Characteristics:** Currently not available  
**3.12 Odor Threshold:** Odorless  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** Currently not available  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Currently not available  
**4.4 Fire Extinguishing Agents Not to Be Used:** Currently not available  
**4.5 Special Hazards of Combustion Products:** Decomposes  
**4.6 Behavior in Fire:** Supports combustion  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent.  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Currently not available  
**5.5 Polymerization:** Currently not available  
**5.6 Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** 72-hour LD<sub>50</sub>, Shrimp = 1.01 ppm  
**6.2 Waterfowl Toxicity:** Oral LD<sub>50</sub> Mallard = 2400 mg/kg Oral LD<sub>50</sub> Mallard = >5000 ppm  
**6.3 Biological Oxygen Demand (BOD):** Stable compound-little degradation  
**6.4 Food Chain Concentration Potential:** High potential  
**6.5 GESAMP Hazard Profile:**  
 Bioaccumulation: +  
 Damage to living resources: -  
 Human Oral hazard: 2  
 Human Contact hazard: I  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Pelleted bait ``450"-0.45% mirex  
**7.2 Storage Temperature:** Currently not available  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Poison  
**8.2 49 CFR Class:** 6.1  
**8.3 49 CFR Package Group:** II  
**8.4 Marine Pollutant:** Yes  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Solid  
**9.2 Molecular Weight:** 545.59  
**9.3 Boiling Point at 1 atm:** Sublimes with decomposition 905°F = 485°C = 758.2°K  
**9.4 Freezing Point:** Not pertinent  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** Currently not available  
**9.8 Liquid Surface Tension:** Not pertinent  
**9.9 Liquid Water Interfacial Tension:** Not pertinent  
**9.10 Vapor (Gas) Specific Gravity:** 18.8 (calculated)  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# MIREX

MRX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# METHANEARSONIC ACID, SODIUM SALT

MSA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Disodium methane arsonate Disodium methyl arsonate DSMA Monosodium methane arsonate Monosodium methyl arsonate MSMA	Solid  Colorless solid; solution may be red or green  Odorless  Solid may float or sink in water; solid and solution mix with water.
Avoid contact with solid and solution. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR SOLUTION Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{AsO}(\text{OH})(\text{ONa})$   
 $\text{CH}_3\text{AsO}(\text{ONa})_2 \cdot 6\text{H}_2\text{O}$   
2.3 IMO/UN Designation: 6.1/1557  
2.4 DOT ID No.: 1557  
2.5 CAS Registry No.: 2163-80-6  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective clothing to prevent contact with skin; chemical goggles.  
3.2 **Symptoms Following Exposure:** Subacute poisoning by arsenicals causes salty taste, burning in throat and stomach, and intestinal pain. Acute toxicity indicated by headache, vomiting, stupor, convulsions, paralysis. About 1 ounce to 1 pound must be taken to cause these symptoms.  
3.3 **Treatment of Exposure:** INGESTION: cause vomiting; give water and repeat; give a saline cathartic such as sodium sulfate. SKIN: wash with soap and water. EYES: wash with water; consult physician if irritation remains.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5\text{-}5 \text{ g/kg (rat)}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** None  
3.11 **Liquid or Solid Characteristics:** Repeated contact may cause skin sensitivity.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic gases may be generated in fires.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** None  
5.2 **Reactivity with Common Materials:** None  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
>1000 ppm/48 hr/bluegill  
sunfish/LC<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** The solid disodium salt (DSMA) contains water crystallization Salts are often shipped as solutions in water with concentrations up to about 50% solids.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid or water solution  
9.2 **Molecular Weight:** 162 (MSMA); 292 (DSMA hexahydrate)  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** (MSMA) 243°F = 117°C = 390°K (DSMA) 137°F = 58°C = 332°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (DSMA) 1.0 at 20°C (solid) (MSMA solutions) 1.4-1.6 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHANEARSONIC ACID, SODIUM SALT

MSA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	D S M A : 3 6  L B / 1 0 0  W A T E R  A T  2		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		NOT P E R T I N E N T

# MERCURIC SULFIDE

MSF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Artificial cinnabar Chinese red Ethiops mineral Mercuric sulfide, black Mercuric sulfide, red Vermilion	Solid  Red or black  Odorless  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear dust respirator and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, foam, or sand. Other extinguishing agents may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. If swallowed will cause coughing, nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: HgS  
2.3 IMO/UN Designation: 6.1/2025  
2.4 DOT ID No.: 2025  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 52342

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves  
3.2 **Symptoms Following Exposure:** Acute poisoning can result from inhaling dust concentrations of 1.2-8.5 mg/m<sup>3</sup> in air; symptoms include pain and tightness in chest, coughing, and difficulty in breathing. If ingested, toxicity depends on release of the Hg<sup>++</sup> ion; chronic mercury poisoning can cause kidney, mental, and nervous disturbances. Dust irritates eyes and frequently causes allergic dermatitis; absorption through skin can cause systemic poisoning.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; give artificial respiration if breathing has stopped. INGESTION: give egg whites, milk, or activated charcoal; induce vomiting; consult physician. EYES: flush with water. SKIN: wash with soap and water.  
3.4 **TLV-TWA:** 0.025 mg/m<sup>3</sup> (as mercury)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Central nervous system affects, tremors, psychological disturbances in humans  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 0.1 mg/m<sup>3</sup> (as mercury)  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, foam, sand  
4.4 **Fire Extinguishing Agents Not to Be Used:** Other agents may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Smoke from fire contains poisonous mercury vapor and irritating sulfur dioxide gas.  
4.6 **Behavior in Fire:** Changes color when hot. Decomposes at burning temperature. The black form may soften, and molten sulfur may flow out and burn.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 9.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 2.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 0  
Human Oral hazard: (3)  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** The black form may contain up to 40% free sulfur.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** Currently not available  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 232.7  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 8 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -1,200 Btu/lb = -670 cal/g = -28 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# MERCURIC SULFIDE

MSF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# MESITYL OXIDE

MSO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isopropylideneacetone Methyl isobuteryl ketone 4-Methyl-3-pentene-2-one	Liquid  Colorless to light yellow  Strong peppermint or honey odor  Floats and mixes with water. Flammable, irritating vapor is produced.
Keep people away. Shut off ignition sources, call fire department. Stay upwind, use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 18; Ketone  
2.2 Formula:  $\text{CH}_3\text{COCH}=\text{C}(\text{CH}_3)_2$   
2.3 IMO/UN Designation: 3.3/1229  
2.4 DOT ID No.: 1229  
2.5 CAS Registry No.: 141-79-7  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air pack or organic canister mask; rubber gloves; goggles.  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat, headache, dizziness, difficult breathing. Contact with liquid or concentrated vapor causes severe eye irritation. Liquid irritates skin. Ingestion causes irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air and restore breathing; call physician. EYES: immediately flush with plenty of water for at least 15 min. SKIN: wash with water. INGESTION: give large amount of water; call physician.  
3.4 **TLV-TWA:** 15 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 25 ppm.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50}$  = 1,120 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** 12 ppm  
3.13 **IDLH Value:** 1,400 ppm  
3.14 **OSHA PEL-TWA:** 25 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 84°F O.C. 73°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 652°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 4.2 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 98.2  
9.3 **Boiling Point at 1 atm:** 266°F = 130°C = 403°K  
9.4 **Freezing Point:** -51°F = -46°C = 227°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.853 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 22.9 dynes/cm = 0.0229 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 157 Btu/lb = 87 cal/g =  $3.7 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -14,400 Btu/lb = -8,000 cal/g =  $-330 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# MESITYL OXIDE

MSO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
15	55.020	70	0.520	42	1.048	52	0.657
20	54.850	75	0.520	44	1.048	54	0.650
25	54.670	80	0.520	46	1.048	56	0.642
30	54.500	85	0.520	48	1.048	58	0.634
35	54.330	90	0.520	50	1.048	60	0.627
40	54.150	95	0.520	52	1.048	62	0.620
45	53.980	100	0.520	54	1.048	64	0.613
50	53.810	105	0.520	56	1.048	66	0.606
55	53.630	110	0.520	58	1.048	68	0.599
60	53.460	115	0.520	60	1.048	70	0.592
65	53.290	120	0.520	62	1.048	72	0.586
70	53.110	125	0.520	64	1.048	74	0.579
75	52.940	130	0.520	66	1.048	76	0.573
80	52.770	135	0.520	68	1.048	78	0.567
85	52.590	140	0.520	70	1.048	80	0.561
90	52.420	145	0.520	72	1.048	82	0.555
95	52.250	150	0.520	74	1.048	84	0.549
100	52.070	155	0.520	76	1.048	86	0.543
		160	0.520				
		165	0.520				
		170	0.520				
		175	0.520				
		180	0.520				
		185	0.520				
		190	0.520				
		195	0.520				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	5.834	55	0.114	55	0.00202	N O T  P E R T I N E N T	
36	5.667	60	0.134	60	0.00236		
38	5.500	65	0.157	65	0.00274		
40	5.334	70	0.184	70	0.00318		
42	5.167	75	0.215	75	0.00367		
44	5.000	80	0.250	80	0.00424		
46	4.834	85	0.290	85	0.00487		
48	4.667	90	0.336	90	0.00558		
50	4.500	95	0.387	95	0.00639		
52	4.334	100	0.446	100	0.00729		
54	4.167	105	0.512	105	0.00830	N O T  P E R T I N E N T	
56	4.000	110	0.587	110	0.00942		
58	3.834	115	0.670	115	0.01067		
60	3.667	120	0.764	120	0.01206		
62	3.500	125	0.870	125	0.01361		
64	3.334	130	0.987	130	0.01532		
66	3.167	135	1.119	135	0.01721		
68	3.000	140	1.264	140	0.01929		
70	2.834	145	1.426	145	0.02158		
72	2.667	150	1.606	150	0.02410		
74	2.500	155	1.805	155	0.02686	N O T  P E R T I N E N T	
76	2.334	160	2.024	160	0.02989		
78	2.167	165	2.267	165	0.03319		
80	2.000	170	2.533	170	0.03680		
82	1.834	175	2.826	175	0.04073		
84	1.667						

# ALPHA-METHYLSTYRENE

MSR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isopropenylbenzene 1-Methyl-1-phenylethylene Phenylpropylene	Liquid	Colorless
Floats on water.		
<b>Keep people away. Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies.</b>		
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. DO NOT INDUCE VOMITING.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $C_9H_8$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 98-83-9  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Neoprene gloves; splashproof goggles or face shield  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory tract, headache, dizziness, light-headedness, and breathlessness. Ingestion causes irritation of mouth and stomach. Contact with liquid irritates eyes. Prolonged skin contact can cause severe rashes, swelling, and blistering.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if he is not breathing, give artificial respiration; contact a physician; keep victim quiet and warm. INGESTION: do NOT induce vomiting; call physician. EYES: flush with water for at least 15 min.; get medical attention. SKIN: wash area with soap and water.  
3.4 TLV-TWA: 50 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 100 ppm  
3.7 Toxicity by Ingestion: Grade 2;  $LD_{50} = 0.5\text{--}5\text{ g/kg}$   
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: <10 ppm  
3.13 IDLH Value: 700 ppm  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: 100 ppm  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 137°F C.C.  
4.2 Flammable Limits in Air: 1.9%–6.1%  
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 1,066°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 54.7 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 14.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: May attack some forms of plastics.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Hazardous polymerization unlikely to occur except when in contact with alkali metals or metallo-organic compounds.  
5.6 Inhibitor of Polymerization: 10–20 ppm tert-butylcatechol

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: 10 ppm/96 hr/fathead minnow/LC<sub>50</sub>  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Commercial  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: A  
7.6 Ship Type: 3  
7.7 Barge Hull Type: 3

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	1

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 118.17  
9.3 Boiling Point at 1 atm: 329°F = 165°C = 438°K  
9.4 Freezing Point: –9.8°F = –23.2°C = 250.0°K  
9.5 Critical Temperature: 719.1°F = 381.7°C = 654.9°K  
9.6 Critical Pressure: 494 psia = 33.6 atm = 3.41 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.91 at 20°C (liquid)  
9.8 Liquid Surface Tension: 33.88 dynes/cm = 0.03388 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 4.08  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.060 at 27°C  
9.12 Latent Heat of Vaporization: 140.4 Btu/lb = 78.0 cal/g =  $3.26 \times 10^5\text{ J/kg}$   
9.13 Heat of Combustion: –17,690 Btu/lb = –9,830 cal/g =  $-411 \times 10^6\text{ J/kg}$   
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.23 psia

### NOTES

# ALPHA-METHYLSTYRENE

MSR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	57.870	N O T  P E R T I N E N T	N O T  P E R T I N E N T	N O T  P E R T I N E N T	N O T  P E R T I N E N T	68	0.940
36	57.800						
38	57.740						
40	57.680						
42	57.620						
44	57.550						
46	57.490						
48	57.430						
50	57.370						
52	57.300						
54	57.240						
56	57.180						
58	57.120						
60	57.050						
62	56.990						
64	56.930						
66	56.870						
68	56.800						
70	56.740						
72	56.680						
74	56.620						
76	56.550						
78	56.490						
80	56.430						
82	56.370						
84	56.310						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.060	70	0.039	70	0.00082	N O T  P E R T I N E N T	N O T  P E R T I N E N T
		80	0.055	80	0.00112		
		90	0.076	90	0.00152		
		100	0.103	100	0.00203		
		110	0.139	110	0.00269		
		120	0.186	120	0.00353		
		130	0.246	130	0.00459		
		140	0.322	140	0.00592		
		150	0.418	150	0.00756		
		160	0.539	160	0.00957		
		170	0.688	170	0.01203		
		180	0.872	180	0.01500		
		190	1.097	190	0.01858		
		200	1.370	200	0.02287		
		210	1.701	210	0.02795		
		220	2.097	220	0.03397		
		230	2.570	230	0.04103		
		240	3.132	240	0.04928		
		250	3.796	250	0.05888		
		260	4.576	260	0.06999		
		270	5.487	270	0.08278		
		280	6.548	280	0.09745		
		290	7.777	290	0.11420		
		300	9.195	300	0.13320		
		310	10.820	310	0.15480		
		320	12.690	320	0.17920		

# METHYLAMINE SOLUTION

MSZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aminomethane Mercurialin Monomethylamine	Water solution  Colorless  Ammonia-like odor  Mixes with water.
<b>Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid. Evacuate area in case of large discharge. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	FLAMMABLE Poisonous gases may be produced in fire. Container may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Let fire burn; stop flow of gas if possible. Cool exposed containers and protect men affecting shut off with water. Extinguish small fires with dry chemical, CO <sub>2</sub> , water spray or alcoholfoam and large fires with water spray, fog or alcohol foam.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will causa coughing and difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Remove contaminated clothing and shoes. Wash affected area with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 <b>CG Compatibility Group:</b> 7; Aliphatic amine 2.2 <b>Formula:</b> CH <sub>3</sub> NH <sub>2</sub> 2.3 <b>IMO/UN Designation:</b> 3.1/1235 2.4 <b>DOT ID No.:</b> 1235 2.5 <b>CAS Registry No.:</b> 74-89-5 2.6 <b>NAERG Guide No.:</b> 132 2.7 <b>Standard Industrial Trade Classification:</b> 51451
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Self-contained (positive pressure, if available) breathing apparatus and full protective clothing. No skin surface should be exposed. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Causes irritation of nose and throat, followed by violent sneezing, burning sensation in throat, coughing and difficulty in breathing, pulmonary congestion, edema of the lungs and conjunctivitis. Bronchitis occurred in a worker exposed to a workroom concentration range of 2-60 ppm. EYES: Liquid contact causes burning (severe exposure may cause blindness). SKIN: Causes burning. Vapors may cause dermatitis. INGESTION: Causes burns of the mouth, throat and esophagus. 3.3 <b>Treatment of Exposure:</b> INHALATION: Remove victim to fresh air at once. If breathing is difficult, give oxygen. If breathing has stopped, give artificial respiration. Get medical attention. EYES: Flush with water for at least 15 minutes. Physician should examine eyes if irritation or pain persists after 15 minutes. SKIN: Exposed area should be washed twice with soap and water. Physician should examine exposed area if pain or irritation persist after area is washed. INGESTION: Do not induce vomiting or perform gastric lavage. Do not attempt to neutralize. Dilute with water or milk in copious amounts. 3.4 <b>TLV-TWA:</b> 5 ppm 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> 15 ppm 3.7 <b>Toxicity by Ingestion:</b> Grade 3; LD <sub>50</sub> = 100-200 mg/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations. 3.11 <b>Liquid or Solid Characteristics:</b> Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure. 3.12 <b>Odor Threshold:</b> 0.021 ppm 3.13 <b>IDLH Value:</b> 100 ppm 3.14 <b>OSHA PEL-TWA:</b> 10 ppm 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 32°F C.C.  
4.2 **Flammable Limits in Air:** 4.3%-21%  
4.3 **Fire Extinguishing Agents:** Small fires: Dry chemical, CO<sub>2</sub>, water spray or alcohol foam. Large fires: Water spray, fog or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic nitrogen oxides may be formed.  
4.6 **Behavior in Fire:** Vapors are heavier than air and may travel a considerable distance to a source of ignition and flashback. When heated to decomposition, it emits toxic fumes of NO<sub>x</sub>.  
4.7 **Auto Ignition Temperature:** 806°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 15.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 4.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves completely.  
5.2 **Reactivity with Common Materials:** Corrosive to copper, copper alloys, zinc alloys, aluminum and galvanized surfaces. Contact with mercury can produce explosive reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Mild acidic solution such as vinegar or 1-2% acetic acid.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 10 - 30 ppm/24 hr/creek chub  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 67.8% in 13 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Anhydrous 99.3+%; water solutions 30-50% by weight  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 2

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	4
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid solution  
9.2 **Molecular Weight:** 31.06  
9.3 **Boiling Point at 1 atm:** 20.66°F = -6.3°C = 266.7°K  
9.4 **Freezing Point:** -134.5°F = -92.5°C = 180.5°K  
9.5 **Critical Temperature:** 314.4°F = 156.9°C = 430.1°K  
9.6 **Critical Pressure:** 590 psia = 40.2 atm = 4.07 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.693 at -6.5°C  
9.8 **Liquid Surface Tension:** 29.2 dynes/cm at -70°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 1.1  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1946  
9.12 **Latent Heat of Vaporization:** 374.90 Btu/lb = 208.29 cal/g = 8.72X10<sup>6</sup> J/kg  
9.13 **Heat of Combustion:** -15,000 Btu/lb = -8,340 cal/g = -34.9 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# METHYLAMINE SOLUTION

MSZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	32	0.236

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# METHYLAMINE

MTA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aminomethane Mercurialin Monomethylamine	Gas  Colorless  Ammonia-like odor  Mixes with water and boils.
Shut off ignition sources. Call fire department. Keep people away. Avoid contact with liquid. Evacuate area in case of large discharge. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Let fire burn. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 7; Aliphatic amine  
2.2 **Formula:** CH<sub>3</sub>NH<sub>2</sub>  
2.3 **IMO/UN Designation:** Anhydrous: 2/1061; aqueous soln: 3.1/1235  
2.4 **DOT ID No.:** 1235 (aqueous), 1061 (anhydrous)  
2.5 **CAS Registry No.:** 74-89-5  
2.6 **NAERG Guide No.:** 118 (anhydrous); 132 (aqueous)  
2.7 **Standard Industrial Trade Classification:** 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face mask; rubber suit, apron, sleeves, and/or gloves; rubber or leather safety shoes; air-line mask, positive-pressure hose mask, self-contained breathing apparatus, or industrial canister-type gas mask.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat, followed by violent sneezing, burning sensation in throat, coughing, constriction of larynx and difficulty in breathing, pulmonary congestion, edema of the lungs, and conjunctivitis. Contact with liquid burns skin and eyes. (Severe exposure may cause blindness.) Vapors may cause dermatitis. Ingestion causes burns of the mouth, throat, and esophagus.
- 3.3 **Treatment of Exposure:** Get medical attention for anyone overcome or injured by exposure to this compound. **INHALATION:** Remove victim to fresh air at once; apply artificial respiration if breathing has stopped; administer oxygen. **EYES:** Flush with water for at least 15 min. **SKIN:** Flush with water; if skin is burned do not use ointments or cover for 24 hours. **INGESTION:** Do NOT induce vomiting; give large amount of water.
- 3.4 **TLV-TWA:** 5 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 15 ppm  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure and may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** 0.021 ppm  
3.13 **IDLH Value:** 100 ppm  
3.14 **OSHA PEL-TWA:** 10 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (flammable, liquefied compressed gas)
- 4.2 **Flammable Limits in Air:** 4.3%-21%
- 4.3 **Fire Extinguishing Agents:** Let gas fire burn; stop flow of gas. Extinguish solution fires with dry chemical, alcohol foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic nitrogen oxides may be formed.
- 4.6 **Behavior in Fire:** Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 806°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 15.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 4.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 10.7%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves completely
- 5.2 **Reactivity with Common Materials:**  
Corrosive to copper, copper alloys, zinc alloys, aluminum, and galvanized surfaces
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
>10 and <30 ppm/24 hr/creek chub/TL<sub>m</sub>
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
67.8% of theoretical in 13 days
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Anhydrous, 99.3+%. Water solutions, 30-50% by weight.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2.1
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 4              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 31.1
- 9.3 **Boiling Point at 1 atm:** 20.3°F = -6.5°C = 266.7°K
- 9.4 **Freezing Point:** -134.5°F = -92.5°C = 180.7°K
- 9.5 **Critical Temperature:** 318.2°F = 159°C = 432.2°K
- 9.6 **Critical Pressure:** 1,080 psia = 73.6 atm = 7.47 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.693 at -6.5°C (liquid)
- 9.8 **Liquid Surface Tension:** 100.59 dynes/cm = 0.1006 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 1.1
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1946
- 9.12 **Latent Heat of Vaporization:** 358 Btu/lb = 199 cal/g = 8.33 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -15,000 Btu/lb = -8,340 cal/g = -34.9 X 10<sup>6</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available \*Properties apply to anhydrous material.

### NOTES

# METHYLAMINE

MTA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	44.090	0	0.783	0	1.569	15	0.257
5	43.880	5	0.788	5	1.556	20	0.250
10	43.670	10	0.793	10	1.543		
15	43.470	15	0.798	15	1.529		
20	43.260	20	0.803	20	1.516		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	108.000	-90	0.339	-90	0.00265	0	0.363
		-80	0.521	-80	0.00398	25	0.374
		-70	0.784	-70	0.00583	50	0.384
		-60	1.157	-60	0.00839	75	0.395
		-50	1.674	-50	0.01184	100	0.406
		-40	2.381	-40	0.01643	125	0.416
		-30	3.330	-30	0.02245	150	0.427
		-20	4.587	-20	0.03023	175	0.438
		-10	6.229	-10	0.04013	200	0.448
		0	8.347	0	0.05261	225	0.459
		10	11.050	10	0.06815	250	0.470
		20	14.450	20	0.08728	275	0.480
		30	18.700	30	0.11060	300	0.491
		40	23.940	40	0.13880	325	0.502
		50	30.360	50	0.17260	350	0.512
		60	38.150	60	0.21270	375	0.523
						400	0.534
						425	0.544
						450	0.555
						475	0.566
						500	0.576
						525	0.587
						550	0.598
						575	0.608
						600	0.619



# METHYL BROMIDE

MTB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bromomethane Embafume M-B-C fumigant Monobromomethane	Liquefied gas  Colorless  Odorless to sweet odor  Sinks and boils in water. Poisonous vapor cloud is formed. Boiling point is 39°F.
<b>Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles, self-contained breathing apparatus, and protective impervious overclothing (including gloves.) Call fire department. Evacuate area in case of large leaks. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. POISONOUS AND IRRITATING GASES ARE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus, and protective overclothing (including gloves). EXTINGUISH WITH WATER, FOAM, OR CARBON DIOXIDE. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration (but NOT mouth-to-mouth). If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Not harmful to aquatic life. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 36; Halogenated hydrocarbon  
2.2 **Formula:** CH<sub>3</sub>Br  
2.3 **IMO/UN Designation:** 2.0/1062  
2.4 **DOT ID No.:** 1062  
2.5 **CAS Registry No.:** 74-83-9  
2.6 **NAERG Guide No.:** 123  
2.7 **Standard Industrial Trade Classification:** 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; goggles.  
3.2 **Symptoms Following Exposure:** Inhalation of vapor causes lung congestion and pulmonary edema. Higher concentrations causes rapid narcosis and death. Contact with liquid irritates eyes and burns skin.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give artificial respiration if needed. SKIN OR EYES: flush with water for at least 15 min.  
3.4 **TLV-TWA:** 1 ppm (skin)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** Odorless.  
3.13 **IDLH Value:** 250 ppm  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 20 ppm (skin)  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Practically not flammable.  
4.2 **Flammable Limits in Air:** 10%-15%  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion**  
**Products:** Toxic and irritating gases are generated when exposed to fire or heat.  
4.6 **Behavior in Fire:** Containers may explode  
4.7 **Auto Ignition Temperature:** 999°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None  
6.2 **Waterfowl Toxicity:** None  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: -  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial: not less than 99.5%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** 1  
7.7 **Barge Hull Type:** 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison gas  
8.2 **49 CFR Class:** 2.3  
8.3 **49 CFR Package Group:** Not pertinent.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** U029  
8.8 **RCRA Waste Number:** U029  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
9.2 **Molecular Weight:** 94.95  
9.3 **Boiling Point at 1 atm:** 38.5°F = 3.6°C = 276.8°K  
9.4 **Freezing Point:** -135°F = -93°C = 180°K  
9.5 **Critical Temperature:** 375.8°F = 191°C = 464.2°K  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.68 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 24.5 dynes/cm = 0.0245 N/m at 15°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.3  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.247  
9.12 **Latent Heat of Vaporization:** 108 Btu/lb = 59.7 cal/g = 2.50 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -3188 Btu/lb = -1771 cal/g = 74.15 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 15.05 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 45 psia

### NOTES

# METHYL BROMIDE

MTB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	107.700	-35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35	0.194 0.195 0.195 0.195 0.195 0.196 0.196 0.196 0.196 0.197 0.197 0.197 0.198 0.198 0.198	-90 -80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30	0.795 0.787 0.779 0.771 0.764 0.756 0.748 0.740 0.732 0.724 0.716 0.708 0.700		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.090	-70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120	0.651 0.944 1.340 1.864 2.547 3.424 4.532 5.914 7.618 9.694 12.200 15.190 18.730 22.880 27.710 33.300 39.710 47.020 55.300 64.639	-70 -60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120	0.01479 0.02090 0.02893 0.03929 0.05244 0.06888 0.08914 0.11380 0.14350 0.17880 0.22030 0.26890 0.32500 0.38940 0.46270 0.54570 0.63900 0.74310 0.85870 0.98640	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.098 0.101 0.104 0.106 0.109 0.112 0.114 0.117 0.120 0.122 0.125 0.127 0.129 0.132 0.134 0.137 0.139 0.141 0.144 0.146 0.148 0.150 0.153 0.155 0.157

# METHYL CHLORIDE

MTC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Artic Chloromethane	Gas  Colorless  Odorless or sweet odor  Floats and boils on water. Flammable, visible vapor cloud is formed.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Cool exposed containers and protect men effecting shutoff with water. Let fire burn.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Not irritating to eyes, nose or throat. If inhaled, will cause nausea, vomiting, headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 36; Halogenated hydrocarbon  
2.2 **Formula:** CH<sub>3</sub>Cl  
2.3 **IMO/UN Designation:** 2.0/1063  
2.4 **DOT ID No.:** 1063  
2.5 **CAS Registry No.:** 74-87-3  
2.6 **NAERG Guide No.:** 115  
2.7 **Standard Industrial Trade Classification:** 51134

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved canister mask; leather or vinyl gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Inhalation causes nausea, vomiting, weakness, headache, emotional disturbances; high concentrations cause mental confusion, eye disturbances, muscular tremors, cyanosis, convulsions. Contact of liquid with skin may cause frostbite.  
3.3 **Treatment of Exposure:** Remove to fresh air. Call a doctor and have patient hospitalized for observation of slowly developing symptoms.  
3.4 **TLV-TWA:** 50 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 100 ppm  
3.7 **Toxicity by Ingestion:** Not pertinent  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin because it evaporates quickly. May cause frostbite.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 2,000 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** 300 ppm, 5 minute peak in any 3 hours.  
3.16 **OSHA PEL-Ceiling:** 200 ppm.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** <32°F C.C.  
4.2 **Flammable Limits in Air:** 8.1%-17.2%  
4.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide. Stop flow of gas.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are generated in fires.  
4.6 **Behavior in Fire:** Containers may explode  
4.7 **Auto Ignition Temperature:** 1170°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 2.2 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 7.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 3.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Reacts with zinc, aluminum, magnesium, and their alloys; reaction is not violent.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** None  
6.2 **Waterfowl Toxicity:** None  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: -  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grade; "Artic" refrigerant grade  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas  
8.2 **49 CFR Class:** 2.1  
8.3 **49 CFR Package Group:** Not pertinent.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U045  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
9.2 **Molecular Weight:** 50.49  
9.3 **Boiling Point at 1 atm:** -11.6°F = -24.2°C = 249°K  
9.4 **Freezing Point:** -143.9°F = 97.7°C = 175.5°K  
9.5 **Critical Temperature:** 290.5°F = 143.6°C = 416.8°K  
9.6 **Critical Pressure:** 969 psia = 65.9 atm = 6.68 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.997 at -24°C (liquid)  
9.8 **Liquid Surface Tension:** 16.2 dynes/cm = 0.0162 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at -24°C  
9.10 **Vapor (Gas) Specific Gravity:** 1.7  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.259  
9.12 **Latent Heat of Vaporization:** 182.3 Btu/lb = 101.3 cal/g = 4.241 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -5290 Btu/lb = -2939 cal/g = -123.1 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 116.7 psia

### NOTES

# METHYL CHLORIDE

MTC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-20 -15	62.170 61.860	-50 -40 -30 -20	0.354 0.357 0.359 0.362		C U R R E N T L Y  N O T  A V A I L A B L E	-30 -20	0.332 0.320

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.600	-55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65	4.590 5.298 6.095 6.987 7.985 9.096 10.330 11.700 13.210 14.880 16.720 18.730 20.940 23.350 25.980 28.840 31.950 35.320 38.960 42.890 47.140 51.700 56.610 61.880 67.520	-55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35 40 45 50 55 60 65	0.05335 0.06083 0.06913 0.07831 0.08843 0.09957 0.11180 0.12520 0.13980 0.15570 0.17300 0.19170 0.21200 0.23390 0.25740 0.28280 0.31000 0.33920 0.37040 0.40380 0.43930 0.47720 0.51740 0.56000 0.60530	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.177 0.182 0.187 0.192 0.197 0.202 0.207 0.212 0.217 0.221 0.226 0.231 0.236 0.240 0.245 0.249 0.254 0.258 0.263 0.267 0.272 0.276 0.281 0.285 0.289

# MONOCHLOROTETRAFLUOROETHANE

MTE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlorotetrafluoroethane 1-Chloro-1,1,2,2-tetrafluoroethane F-124 Halon 241 R-124	Gas                      Colorless
Keep people away. Avoid contact with vapor or liquid. Stay upwind; keep out of low areas. Wear self-contained breathing apparatus and full protective clothing.	
<b>Fire</b>	Not flammable Container may explode in heat of fire. Fire may produce irritating or toxic gases. Move container from fire area if you can do it without risk. Stay away from ends of tanks. Cool containers that are exposed to flames with water from the side until well after fire is out. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR Vapors may cause dizziness or suffocation. Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Contact with liquid may cause frostbite. Remove contaminated clothing and shoes. Flush affected areas with lukewarm water. DO NOT USE HOT WATER
<b>Water Pollution</b>	Not pertinent

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: CHF<sub>2</sub>CHClF<sub>2</sub>
- 2.3 IMO/UN Designation: 2.2/1021
- 2.4 DOT ID No.: 1021
- 2.5 CAS Registry No.: 63938-10-3
- 2.6 NAERG Guide No.: 126
- 2.7 Standard Industrial Trade Classification: 51137

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, chemical safety goggles, chemical resistant gloves, other protective clothing
- 3.2 **Symptoms Following Exposure:** Displaces air such that oxygen content may become too low to support life. Prolonged exposure can cause narcotic effect or rapid suffocation. Contact with liquid may cause frostbite.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SKIN OR EYES: Remove contaminated clothing and shoes, flush affected area with lukewarm water. DO NOT USE HOT WATER.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to the eyes and throat.
- 3.11 Liquid or Solid Characteristics: Minimum hazard. Contact with liquid may cause frostbite.
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not flammable
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Not pertinent
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available
- 7.2 Storage Temperature: Currently not available
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Nonflammable Gas
- 8.2 49 CFR Class: 2.2
- 8.3 49 CFR Package Group: Not pertinent.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
 

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Gas
- 9.2 Molecular Weight: 136.48
- 9.3 Boiling Point at 1 atm: 13.6°F = -10.2°C = 263°K
- 9.4 Freezing Point: -179°F = -117°C = 156°K
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: Currently not available
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: 4.71
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Currently not available
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# MONOCHLOROTETRAFLUOROETHANE

MTE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.146 0.150 0.155 0.159 0.163 0.168 0.172 0.176 0.180 0.185 0.189 0.193 0.198 0.202 0.206 0.210 0.215 0.219 0.223 0.228 0.232 0.236 0.240 0.245 0.249

# METHYL FORMAL

MTF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dimethoxymethane Dimethyl formal Formaldehyde dimethylacetol Methylal Methylene dimethyl ether	Liquid  Colorless  Mild sweet odor  Mixes with water. Flammable, irritating vapor is produced.
Keep people away. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Irritating gases may be produced when heated. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, having victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 41; Ether  
2.2 Formula:  $\text{CH}_2(\text{OCH}_3)_2$   
2.3 IMO/UN Designation: 3.1/1234  
2.4 DOT ID No.: 1234  
2.5 CAS Registry No.: 109-87-5  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus or all-purpose canister mask; rubber gloves; chemical safety goggles; impervious apron and boots.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory system and depression of central nervous system. Liquid causes irritation of eyes and will irritate skin if allowed to remain. Ingestion causes depression of central nervous system.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from contaminated area and administer artificial respiration and oxygen if necessary. EYES: flush with plenty of water; get medical attention. SKIN: flush with plenty of water. INGESTION: induce vomiting; administer gastric lavage and saline cathartics; subsequent treatment is symptomatic and supportive.
- 3.4 TLV-TWA: 1,000 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1;  $\text{LD}_{50}$  = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Liver and kidney injury may follow high exposures.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: 2,200 ppm  
3.14 OSHA PEL-TWA: 1,000 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 0°F O.C.  
4.2 **Flammable Limits in Air:** 1.6%-17.6%  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Irritating formaldehyde gas may be present in smoke.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 459°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 5.5 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 23.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	2

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 76.1  
9.3 **Boiling Point at 1 atm:** 108°F = 42°C = 315°K  
9.4 **Freezing Point:** -157°F = -105°C = 168°K  
9.5 **Critical Temperature:** 419.0°F = 215°C = 488.2°K  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.861 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 21.1 dynes/cm = 0.0211 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.6  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0888  
9.12 **Latent Heat of Vaporization:** 161.5 Btu/lb 89.8 cal/g =  $3.76 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -10,970 Btu/lb = -6,100 cal/g =  $-255 \times 10^3$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL FORMAL

MTF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	54.860	10	0.484	51	1.048	35	0.396
36	54.790	15	0.486	52	1.048	40	0.388
38	54.720	20	0.488	53	1.048	45	0.380
40	54.650	25	0.490	54	1.048	50	0.372
42	54.580	30	0.491	55	1.048	55	0.365
44	54.520	35	0.493	56	1.048	60	0.358
46	54.450	40	0.495	57	1.048	65	0.351
48	54.380	45	0.497	58	1.048	70	0.344
50	54.310	50	0.498	59	1.048	75	0.338
52	54.240	55	0.500	60	1.048	80	0.332
54	54.170	60	0.502	61	1.048	85	0.326
56	54.100	65	0.503	62	1.048	90	0.320
58	54.030	70	0.505	63	1.048	95	0.315
60	53.960	75	0.507	64	1.048	100	0.309
62	53.890	80	0.509	65	1.048		
64	53.820			66	1.048		
66	53.750			67	1.048		
68	53.680			68	1.048		
70	53.610			69	1.048		
72	53.540			70	1.048		
74	53.470			71	1.048		
76	53.410			72	1.048		
				73	1.048		
				74	1.048		
				75	1.048		
				76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
60	32.000	35	2.738	35	0.03924	0	0.294
		40	3.122	40	0.04430	20	0.301
		45	3.551	45	0.04989	40	0.309
		50	4.029	50	0.05604	60	0.317
		55	4.560	55	0.06281	80	0.324
		60	5.149	60	0.07024	100	0.332
		65	5.800	65	0.07836	120	0.339
		70	6.518	70	0.08724	140	0.347
		75	7.310	75	0.09693	160	0.354
		80	8.181	80	0.10750	180	0.362
		85	9.136	85	0.11890	200	0.369
		90	10.180	90	0.13130	220	0.376
		95	11.330	95	0.14480	240	0.383
		100	12.580	100	0.15930	260	0.390
		105	13.940	105	0.17500	280	0.397
		110	15.420	110	0.19180	300	0.404
						320	0.411
						340	0.417
						360	0.424
						380	0.431
						400	0.437
						420	0.444
						440	0.450



# METHANE

MTH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Marsh gas Natural gas	Gas Colorless Weak odor  Liquid floats and boils on water. Flammable visible vapor cloud is produced.
<b>Keep people away.</b> Avoid inhalation. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Evacuate area in case of large discharge. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. May explode if ignited in an enclosed area. Stop discharge if possible. Cool exposed containers and protect men effecting shutoff with water. Let fire burn.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Not irritating to eyes, nose or throat. If inhaled, will cause dizziness, difficult breathing, and loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 31; Paraffin
- 2.2 Formula: CH<sub>4</sub>
- 2.3 IMO/UN Designation: 2.0/1971
- 2.4 DOT ID No.: 1971
- 2.5 CAS Registry No.: 74-82-8
- 2.6 NAERG Guide No.: 115
- 2.7 Standard Industrial Trade Classification: 51114

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus for high concentrations; protective clothing if exposed to liquid.
- 3.2 **Symptoms Following Exposure:** High concentrations may cause asphyxiation. No systemic effects, even at 5% concentration in air.
- 3.3 **Treatment of Exposure:** Remove to fresh air. Support respiration.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin, because it evaporates quickly, but may cause some frostbite.
- 3.12 **Odor Threshold:** 200 ppm
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Flammable gas
- 4.2 **Flammable Limits in Air:** 5.0%-15.0%
- 4.3 **Fire Extinguishing Agents:** Stop flow of gas
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water
- 4.5 **Special Hazards of Combustion Products:** None
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 1004°F
- 4.8 **Electrical Hazards:** Class I, Group D
- 4.9 **Burning Rate:** 12.5 mm/min.
- 4.10 **Adiabatic Flame Temperature:** 2339. (Est.)
- 4.11 **Stoichiometric Air to Fuel Ratio:** 9.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 3.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 12.0-12.1%; CO<sub>2</sub> diluent: 14.0-14.5%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research grade; pure grade
- 7.2 **Storage Temperature:** -260°F
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2.1
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 16.04
- 9.3 **Boiling Point at 1 atm:** -258.7°F = -161.5°C = 111.7°K
- 9.4 **Freezing Point:** -296.5°F = -182.5°C = 90.7°K
- 9.5 **Critical Temperature:** -116.5°F = -82.5°C = 190.7°K
- 9.6 **Critical Pressure:** 668 psia = 45.44 atm = 4.60 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.422 at -160°C (liquid)
- 9.8 **Liquid Surface Tension:** 14 dynes/cm = 0.014 N/m at -161°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at -161°C
- 9.10 **Vapor (Gas) Specific Gravity:** 0.55 1.0
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.306
- 9.12 **Latent Heat of Vaporization:** 219.4 Btu/lb = 121.9 cal/g = 5,100 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -21,517 Btu/lb = -11,954 cal/g = -500.2 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 13.96 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Very high

### NOTES

# METHANE

MTH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-290	27.990	-290	0.802		N	-290	0.290
-288	27.900	-285	0.808		O	-285	0.254
-286	27.800	-280	0.815		T	-280	0.225
-284	27.700	-275	0.821			-275	0.200
-282	27.610	-270	0.827		P	-270	0.179
-280	27.510	-265	0.833		E	-265	0.161
-278	27.410	-260	0.839		R	-260	0.146
-276	27.310				T		
-274	27.220				I		
-272	27.120				N		
-270	27.020				E		
-268	26.930				N		
-266	26.830				T		
-264	26.730						
-262	26.630						
-260	26.540						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	-290	2.640	-290	0.02325	0	0.504
	N	-288	3.006	-288	0.02617	25	0.513
	S	-286	3.412	-286	0.02936	50	0.522
	O	-284	3.861	-284	0.03284	75	0.532
	L	-282	4.355	-282	0.03663	100	0.541
	U	-280	4.898	-280	0.04074	125	0.551
	B	-278	5.494	-278	0.04519	150	0.561
	L	-276	6.146	-276	0.05000	175	0.572
	E	-274	6.858	-274	0.05519	200	0.582
		-272	7.633	-272	0.06077	225	0.593
		-270	8.474	-270	0.06676	250	0.604
		-268	9.387	-268	0.07318	275	0.615
		-266	10.370	-266	0.08004	300	0.626
		-264	11.440	-264	0.08736	325	0.638
		-262	12.590	-262	0.09516	350	0.650
		-260	13.820	-260	0.10350	375	0.662
		-258	15.150	-258	0.11230	400	0.674
		-256	16.570	-256	0.12160	425	0.686
		-254	18.100	-254	0.13150	450	0.699
		-252	19.720	-252	0.14190	475	0.712
		-250	21.460	-250	0.15290	500	0.724
		-248	23.310	-248	0.16450	525	0.738
		-246	25.270	-246	0.17670	550	0.751
		-244	27.360	-244	0.18960	575	0.765
		-242	29.580	-242	0.20300	600	0.778
		-240	31.920	-240	0.21710		

# 4-METHYL-1-PENTENE

MTN

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid

Colorless

Keep people away. Avoid contact with liquid and vapor.  
Avoid inhalation.  
Evacuate area.  
Shut off ignition sources. Call fire department.  
Wear self-contained breathing apparatus and protective clothing.  
Stay upwind and use water spray to "knock down" vapor.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

FLAMMABLE.  
Flashback along vapor trail may occur.  
Vapor may explode if ignited in an enclosed area.  
Water may be ineffective on fire.  
Extinguish with dry chemical, alcohol foam, or CO<sub>2</sub>.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.  
  
VAPOR  
If inhaled, will cause dizziness, difficult breathing, or loss of consciousness.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.  
  
LIQUID  
Irritating to skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 30; Olefins  
2.2 Formula: (CH<sub>3</sub>)<sub>2</sub>CHCH<sub>2</sub>CH=CH<sub>2</sub>  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 691-37-2  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51119

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained breathing apparatus, rubber boots, heavy rubber gloves and eye protection.  
3.2 **Symptoms Following Exposure:** Harmful if inhaled or swallowed. Vapor or mist is irritating to the eyes, mucous membrane and upper respiratory tract. Causes skin irritation. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Separate the eyelids with the fingers and flush with plenty of water. SKIN: Immediately wash with soap and copious amounts of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of skin and first degree burn on short exposure. May cause second degree burn on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
-25°F C.C.  
4.2 **Flammable Limits in Air:** LEL 1.2%-upper explosive limit data not available.  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Vapors may travel considerable distance to source of ignition and flashback. Container explosion may occur under fire conditions. Forms explosive mixtures in air.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Not pertinent.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: (1)  
Human Contact hazard: 0  
Reduction of amenities: -

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Data not available.  
7.4 **Venting:** Data not available.  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 84.16  
9.3 **Boiling Point at 1 atm:** 127.4-129.2°F = 53-54°C = 326.2-327.2°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.665  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 2.9  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 8.49 psia

## NOTES

# 4-METHYL-1-PENTENE

MTN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	68 100	8.509 8.490		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.328 0.344 0.360 0.375 0.390 0.405 0.000 0.434 0.448 0.461 0.475 0.488 0.501 0.514 0.526 0.538 0.550 0.562 0.573 0.585 0.596 0.607 0.617 0.627 0.638

# MOLYBDIC TRIOXIDE

MTO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Molybdenum trioxide Molybdic anhydride	Solid  Colorless to white or yellow  Odorless  Sinks in water.
Keep people away. Avoid contact with solid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: MoO<sub>3</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 1313-27-5
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52269

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: U.S. Bu. Mines approved respirator; safety glasses or face shield; protective gloves
- 3.2 Symptoms Following Exposure: Compound is relatively nontoxic. Dust irritates eyes.
- 3.3 Treatment of Exposure: No treatment necessary except those applicable to any nontoxic dust. EYES: flush with water.
- 3.4 TLV-TWA: 5 mg/m<sup>3</sup> as Mo
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 50-500 mg/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 1000 mg Mo/m<sup>3</sup>
- 3.14 OSHA PEL-TWA: 5 mg/m<sup>3</sup> as Mo
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 70 ppm/96 hr/fathead minnow/TLW/soft water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: Not listed
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical, 59.8-61.6%; Reagent
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 143.94
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 4.69 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# MOLYBDIC TRIOXIDE

MTO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.011		N		N		N
36	0.022		O		O		O
38	0.033		T		T		T
40	0.044						
42	0.056		P		P		P
44	0.067		E		E		E
46	0.078		R		R		R
48	0.089		T		T		T
50	0.100		I		I		I
52	0.111		N		N		N
54	0.122		E		E		E
56	0.133		N		N		N
58	0.144		E		E		E
60	0.155		N		N		N
62	0.167		T		T		T
64	0.178						
66	0.189						
68	0.200						
70	0.211						
72	0.222						
74	0.233						
76	0.244						
78	0.255						
80	0.267						
82	0.278						
84	0.289						

# METHYLTRICHLOROSILANE

MTS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Trichloromethylsilane	Liquid	Colorless	Sharp irritating odor
Reacts violently with water. Irritating gas is produced on contact with water.			
<b>Evacuate.</b> <b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Avoid inhalation. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE. DO NOT USE WATER OR FOAM ON ADJACENT FIRES.		
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not burn  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CH<sub>3</sub>SiCl<sub>3</sub>  
2.3 IMO/UN Designation: 3.2/1250  
2.4 DOT ID No.: 1250  
2.5 CAS Registry No.: 75-79-6  
2.6 NAERG Guide No.: 155  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full protective clothing; acid-vapor-type respiratory protection; rubber gloves; chemical worker's goggles; other protective equipment as necessary to protect skin and eyes.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membrane. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention at once following all exposures to this compound.  
INHALATION: remove victim from exposure; give artificial respiration if breathing has ceased.  
EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; give large amounts of water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Decomposes in moist air, creating HCl with odor threshold of 1 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 45°F O.C. 15°F C.C.  
4.2 **Flammable Limits in Air:** 5.1%- >20%  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam  
4.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene gases may form in fires.  
4.6 **Behavior in Fire:** Difficult to extinguish; re-ignition may occur. Contact with water applied to adjacent fires produces irritating hydrogen chloride.  
4.7 **Auto Ignition Temperature:** >760  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 1.9 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 9.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently to form hydrogen chloride (hydrochloric acid).  
5.2 **Reactivity with Common Materials:** Reacts with surface moisture to evolve hydrogen chloride, which is corrosive to metals.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 2              |
| Special (White).....      | W              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 149.5  
9.3 **Boiling Point at 1 atm:** 151.5°F = 66.4°C = 339.6°K  
9.4 **Freezing Point:** -130°F = -90°C = 183°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.27 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** 20.3 dynes/cm = 0.0203 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 5.16  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 89.3 Btu/lb = 49.6 cal/g = 2.08 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -3,000 Btu/lb = -1,700 cal/g = -70 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYLTRICHLOROSILANE

MTS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	80.770	52	0.350	42	0.984	51	4.064
36	80.700	54	0.350	44	0.984	52	4.005
38	80.629	56	0.350	46	0.984	53	3.948
40	80.559	58	0.350	48	0.984	54	3.892
42	80.490	60	0.350	50	0.984	55	3.836
44	80.419	62	0.350	52	0.984	56	3.782
46	80.349	64	0.350	54	0.984	57	3.729
48	80.280	66	0.350	56	0.984	58	3.677
50	80.209	68	0.350	58	0.984	59	3.625
52	80.139	70	0.350	60	0.984	60	3.575
54	80.070	72	0.350	62	0.984	61	3.525
56	80.000	74	0.350	64	0.984	62	3.476
58	79.929	76	0.350	66	0.984	63	3.428
60	79.870	78	0.350	68	0.984	64	3.381
62	79.799	80	0.350	70	0.984	65	3.335
64	79.730	82	0.350	72	0.984	66	3.290
66	79.660	84	0.350	74	0.984	67	3.245
68	79.589	86	0.350	76	0.984	68	3.201
70	79.520			78	0.984	69	3.158
72	79.450			80	0.984	70	3.116
74	79.379			82	0.984	71	3.074
76	79.309			84	0.984	72	3.033
78	79.240			86	0.984	73	2.993
80	79.169			88	0.984	74	2.954
82	79.099					75	2.915
84	79.030					76	2.877

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	0	0.408	0	0.01237		N
	E	5	0.478	5	0.01434		O
	A	10	0.558	10	0.01656		T
	C	15	0.650	15	0.01906		
	T	20	0.753	20	0.02188		P
	S	25	0.871	25	0.02503		E
		30	1.004	30	0.02857		R
		35	1.155	35	0.03251		T
		40	1.323	40	0.03689		I
		45	1.513	45	0.04175		N
		50	1.725	50	0.04714		E
		55	1.962	55	0.05309		N
		60	2.226	60	0.05966		N
		65	2.519	65	0.06687		T
		70	2.845	70	0.07480		
		75	3.205	75	0.08348		
		80	3.602	80	0.09297		
		85	4.041	85	0.10330		
		90	4.523	90	0.11460		
		95	5.052	95	0.12690		
		100	5.633	100	0.14020		
		105	6.267	105	0.15460		
		110	6.961	110	0.17020		
		115	7.717	115	0.18700		
		120	8.539	120	0.20520		



# METHYL ACETATE

MTT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, methyl ester	Liquid Colorless Mild sweet odor  Mixes with water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Avoid inhalation. Shut off ignition sources, call fire department. Stay upwind, use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, or dizziness. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Ester
- 2.2 Formula:  $\text{CH}_3\text{COOCH}_3$
- 2.3 IMO/UN Designation: 3.2/1231
- 2.4 DOT ID No.: 1231
- 2.5 CAS Registry No.: 79-20-9
- 2.6 NAERG Guide No.: 129
- 2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air mask or organic canister mask; goggles or face shield.
- 3.2 **Symptoms Following Exposure:** (Very similar to those of methyl alcohol, which constitutes 20% of commercial grade.) Inhalation causes headache, fatigue, and drowsiness; high concentrations can produce central nervous system depression and optic nerve damage. Liquid irritates eyes and may cause defatting and cracking of skin. Ingestion causes headache, dizziness, drowsiness, fatigue; may cause severe eye damage.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from affected area; if breathing has ceased, apply artificial respiration; call doctor. EYES: irrigate thoroughly with water for 15 min. and call doctor. SKIN: wash affected area with water. INGESTION: get medical attention for methyl alcohol poisoning.
- 3.4 TLV-TWA: 200 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: 250 ppm
- 3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 3,700 \text{ mg/kg}$  (rabbit)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Optic nerve may be damaged following overexposure to vapor or liquid.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 3,100 ppm
- 3.14 OSHA PEL-TWA: 200 ppm
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 22°F O.C. 14°F C.C.
- 4.2 **Flammable Limits in Air:** 3.1%-16%
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 935°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 3.7 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):**  $\text{N}_2$  diluent: 10.9-11.0%;  $\text{CO}_2$  diluent: 13.5%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly to form acetic acid and methyl alcohol; the reaction is not violent.
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 0
  - Human Oral hazard: 1
  - Human Contact hazard: 0
  - Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 78-82%; remainder is methyl alcohol.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid
- 8.2 49 CFR Class: 3
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 74.1
- 9.3 **Boiling Point at 1 atm:** 134.6°F = 57.0°C = 330.2°K
- 9.4 **Freezing Point:** -145.3°F = 98.5°C = 174.7°K
- 9.5 **Critical Temperature:** 452.7°F = 233.7°C = 506.9°K
- 9.6 **Critical Pressure:** 666 psia = 45.3 atm = 4.60 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.927 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.030 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** 2.8
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1192
- 9.12 **Latent Heat of Vaporization:** 174 Btu/lb = 97 cal/g = 4.1 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** 9,260 Btu/lb = 5,150 cal/g = 215 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 4.6 psia

### NOTES

# METHYL ACETATE

MTT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	61.170	15	0.482	30	1.145	40	0.448
10	60.680	20	0.483	35	1.139	50	0.417
20	60.200	25	0.485	40	1.133	60	0.390
30	59.710	30	0.486	45	1.126	70	0.366
40	59.220	35	0.488	50	1.120	80	0.344
50	58.740	40	0.489	55	1.114	90	0.324
60	58.250	45	0.491	60	1.107	100	0.306
70	57.770	50	0.492	65	1.101	110	0.289
80	57.281	55	0.494	70	1.095	120	0.274
90	56.800	60	0.496	75	1.088	130	0.260
100	56.310	65	0.497	80	1.082		
110	55.830	70	0.499	85	1.076		
120	55.340	75	0.500	90	1.069		
130	54.860	80	0.502	95	1.063		
		85	0.503	100	1.057		
		90	0.505	105	1.050		
		95	0.506				
		100	0.508				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	24.350	35	1.255	35	0.01752	0	0.230
		40	1.453	40	0.02007	25	0.238
		45	1.677	45	0.02294	50	0.246
		50	1.931	50	0.02615	75	0.254
		55	2.216	55	0.02972	100	0.262
		60	2.537	60	0.03370	125	0.270
		65	2.897	65	0.03812	150	0.278
		70	3.300	70	0.04301	175	0.286
		75	3.749	75	0.04841	200	0.294
		80	4.250	80	0.05437	225	0.302
		85	4.807	85	0.06092	250	0.311
		90	5.424	90	0.06812	275	0.319
		95	6.108	95	0.07601	300	0.327
		100	6.863	100	0.08465	325	0.335
		105	7.695	105	0.09407	350	0.343
		110	8.611	110	0.10430	375	0.351
		115	9.617	115	0.11550	400	0.359
		120	10.720	120	0.12770	425	0.367
		125	11.930	125	0.14080	450	0.375
		130	13.250	130	0.15510	475	0.383
		135	14.690	135	0.17050	500	0.392
		140	16.260	140	0.18710	525	0.400
						550	0.408
						575	0.416
						600	0.424

# METHYL VINYL KETONE

MVK

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 3-Buten-2-one	Liquid  Colorless to light yellow  Strong irritating odor  Mixes with water. Irritating vapor is produced.
Evacuate. <b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID.</b> Avoid inhalation. Wear rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{COCH}=\text{CH}_2$   
2.3 IMO/UN Designation: 3.2/1251  
2.4 DOT ID No.: 1251  
2.5 CAS Registry No.: 78-94-4  
2.6 NAERG Guide No.: 131P  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus with full face piece; rubber gloves; chemical goggles or face piece of breathing apparatus.  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Vapor causes tears; contact with liquid can burn eyes. Liquid irritates skin and will cause burn if not removed at once. Ingestion causes irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** Get medical attention for all exposures to this compound. INHALATION: move victim to fresh air; administer artificial respiration if necessary. EYES or SKIN: flush with copious quantity of water for 15 min. INGESTION: do NOT induce vomiting.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Notice of intended change: 0.2 ppm  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4;  $\text{LD}_{50}$  <50 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** 0.5 mg/m<sup>3</sup>  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 30°F O.C. 20°F C.C.  
4.2 **Flammable Limits in Air:** 2.1% 15.6%  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. At elevated temperatures (fire conditions) polymerization may take place in containers, causing violent rupture. Unburned vapors are very irritating.  
4.7 **Auto Ignition Temperature:** 915°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 4.5 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Polymerizes spontaneously upon exposure to heat or sunlight  
5.6 **Inhibitor of Polymerization:** Up to 1% hydroquinone

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98.5+%  
7.2 **Storage Temperature:** Cool ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	2

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 70.1  
9.3 **Boiling Point at 1 atm:** 178.5°F = 81.4°C = 354.6°K  
9.4 **Freezing Point:** 20°F = -7°C = 266°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.864 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 24 dynes/cm = 0.024 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1053  
9.12 **Latent Heat of Vaporization:** (est.) 203 Btu/lb = 113 cal/g = 4.73 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -14,600 Btu/lb = -8,100 cal/g = -340 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** -455 Btu/lb = -253 cal/g = -10.6 X 10<sup>3</sup> J/kg  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# METHYL VINYL KETONE

MVK

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	55.110	42	0.400	51	1.048	51	0.954
36	55.040	44	0.400	52	1.048	52	0.945
38	54.970	46	0.400	53	1.048	53	0.937
40	54.900	48	0.400	54	1.048	54	0.928
42	54.830	50	0.400	55	1.048	55	0.920
44	54.770	52	0.400	56	1.048	56	0.912
46	54.700	54	0.400	57	1.048	57	0.904
48	54.630	56	0.400	58	1.048	58	0.896
50	54.560	58	0.400	59	1.048	59	0.888
52	54.490	60	0.400	60	1.048	60	0.880
54	54.420	62	0.400	61	1.048	61	0.872
56	54.350	64	0.400	62	1.048	62	0.865
58	54.280	66	0.400	63	1.048	63	0.857
60	54.210	68	0.400	64	1.048	64	0.850
62	54.140	70	0.400	65	1.048	65	0.842
64	54.070	72	0.400	66	1.048	66	0.835
66	54.000	74	0.400	67	1.048	67	0.828
68	53.930	76	0.400	68	1.048	68	0.821
70	53.860			69	1.048	69	0.814
72	53.790			70	1.048	70	0.807
74	53.720			71	1.048	71	0.800
76	53.660			72	1.048	72	0.794
78	53.590			73	1.048	73	0.787
80	53.520			74	1.048	74	0.780
82	53.450			75	1.048	75	0.774
84	53.380			76	1.048	76	0.768

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	70	1.390	70	0.01714	0	0.268
	I	75	1.582	75	0.01932	20	0.277
	S	80	1.796	80	0.02174	40	0.285
	C	85	2.035	85	0.02439	60	0.294
	I	90	2.299	90	0.02732	80	0.302
	B	95	2.593	95	0.03052	100	0.311
	L	100	2.917	100	0.03404	120	0.319
	E	105	3.275	105	0.03788	140	0.327
		110	3.670	110	0.04207	160	0.335
		115	4.105	115	0.04664	180	0.343
		120	4.581	120	0.05161	200	0.351
		125	5.104	125	0.05701	220	0.358
		130	5.676	130	0.06286	240	0.366
		135	6.301	135	0.06919	260	0.373
		140	6.982	140	0.07603	280	0.380
		145	7.723	145	0.08341	300	0.388
		150	8.530	150	0.09136	320	0.395
		155	9.405	155	0.09992	340	0.402
		160	10.350	160	0.10910	360	0.408
		165	11.380	165	0.11900	380	0.415
		170	12.490	170	0.12950	400	0.422
		175	13.690	175	0.14090	420	0.428
						440	0.435
						460	0.441
						480	0.447
						500	0.453

# NITRILOTRIACETIC ACID AND SALTS

NAA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Disodium nitrilotriacetate NTA Triglycine Trisodium nitrilotriacetate	Solid  White  Odorless   Sinks and mixes with water
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_3H_3O_6NNa_3$ ,  $C_3H_4O_6NNa_2$ ,  $C_3H_5O_6N$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51465

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; rubber gloves; chemical safety goggles  
3.2 Symptoms Following Exposure: Toxicity and health hazard of these compounds are low. Contact with eyes causes irritation.  
3.3 Treatment of Exposure: EYES: flush with plenty of water; treat as mild alkaline irritation with boric acid solution; if eyes are irritated, get medical attention. SKIN: flush with plenty of water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2;  $LD_{50} = 0.5-5$  g/kg. Disodium Grade 2;  $LD_{50} = 1.2$  g/kg (rat). Trisodium Grade 2;  $LD_{50} = 4$  g/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 340 ppm/24 hr/guppy/lethal conc./fresh water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 0%, 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 99.5+%; a water solution of trisodium salt containing 43% solids is also shipped.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: Acid 191; Disodium 253; Trisodium 275  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: >1 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# NITRILOTRIACETIC ACID AND SALTS

NAA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	40.000		N		N		N
36	40.000		O		O		O
38	40.000		T		T		T
40	40.000						
42	40.000		P		P		P
44	40.000		E		E		E
46	40.000		R		R		R
48	40.000		T		T		T
50	40.000		I		I		I
52	40.000		N		N		N
54	40.000		E		E		E
56	40.000		N		N		N
58	40.000		E		E		E
60	40.000		N		N		N
62	40.000		T		T		T
64	40.000						
66	40.000						
68	40.000						
70	40.000						
72	40.000						
74	40.000						
76	40.000						
78	40.000						
80	40.000						
82	40.000						
84	40.000						

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chem bam Disodium ethylenebis[dithiocarbamate] Dithane EBDC, sodium salt Ethylenebis [dithiocarbamic acid], disodium salt	Solid or solution  Colorless to light amber  Slight odor  Mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLUTION AND SOLID. Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Not flammable. Poisonous and flammable gases are produced if the solution boils. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CON- VULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_4H_6N_2S_2Na_2$   
2.3 IMO/UN Designation: 6.1/1609  
2.4 DOT ID No.: 2757  
2.5 CAS Registry No.: 142-59-6  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification:  
51542

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; self-contained breathing apparatus if compound is hot; goggles; rubber gloves.  
3.2 **Symptoms Following Exposure:** Contact with liquid irritates eyes and may cause mild to severe erythema of skin as well as sensitization reactions.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; administer artificial respiration and oxygen, if indicated. EYES: flush with copious quantities of water for 15 min.; call a physician. SKIN: wash thoroughly with soap and water. INGESTION: induce vomiting and follow with gastric lavage; get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral  $LD_{50} = 395$  mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Degrades to ethylenethiourea, which may affect thyroid gland of animals.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** If water solution boils, poisonous hydrogen sulfide and highly flammable carbon disulfide vapors form.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction unless water is boiling hot, when poisonous hydrogen sulfide and flammable carbon disulfide vapors form.  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
2.1 ppm/24 hr/fingerling channel  
catfish/lethal/fresh water  
1-10 ppm"/marine plankton/killed or no growth/salt water  
\*Time period not specified.  
6.2 **Waterfowl Toxicity:**  $LD_{50} = 2560$  ppm  
(acute exposure)  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 2  
Human Contact hazard: -  
Reduction of amenities: -

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; 22% solution in water  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 256.3  
9.3 **Boiling Point at 1 atm:** Not pertinent  
(decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.14 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available \*Data refer to the solid material.

## NOTES

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# NITRIC ACID

NAC

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Watery liquid      Colorless to light brown      Choking odor

Sinks and mixes with water. Harmful vapor is produced.

Evacuate.  
Keep people away. **AVOID CONTACT WITH LIQUID AND VAPOR.**  
Avoid inhalation.  
Wear chemical protective suit with self-contained breathing apparatus.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
May cause fire on contact with combustibles.  
Flammable gas may be formed on contact with metals.  
Poisonous gases are produced when heated.  
Wear chemical protective suit with self-contained breathing apparatus.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.

VAPOR  
Will burn eyes, nose and throat.  
If inhaled, will cause difficult breathing or loss of consciousness.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

LIQUID  
Will burn skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
**DO NOT INDUCE VOMITING.**

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 3; Nitric acid  
2.2 Formula:  $\text{HNO}_3\text{-H}_2\text{O}$   
2.3 IMO/UN Designation: 8.0/2031  
2.4 DOT ID No.: 2031  
2.5 CAS Registry No.: 7697-37-2  
2.6 NAERG Guide No.: 157  
2.7 Standard Industrial Trade Classification: 52233

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air mask; rubber acid suit, hood, boots and gloves; chemical goggles; safety shower and eye bath.
- 3.2 **Symptoms Following Exposure:** Vapors irritate eyes and respiratory tract; lung injury may not become apparent for several hours following exposure. Liquid may cause severe burns to eyes and skin.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air, administer artificial respiration if required. INGESTION: drink large volumes of water; do NOT induce vomiting. SKIN OR EYES: flush with water for at least 15 min.
- 3.4 TLV-TWA: 2 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: 4 ppm
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 50 to 500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** 58-68%; Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 95%: Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: 25 ppm
- 3.14 OSHA PEL-TWA: 2 ppm
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Use water on adjacent fires.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** May give off poisonous oxides of nitrogen and acid fumes when heated in fires.
- 4.6 **Behavior in Fire:** Decomposes and gives off poisonous oxides of nitrogen.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** May heat up on mixing, but explosion or formation of steam unlikely.
- 5.2 **Reactivity with Common Materials:** Very corrosive to wood, paper, cloth and most metals. Toxic red oxides of nitrogen are formed.
- 5.3 **Stability During Transport:** When heated may give off toxic red oxides of nitrogen.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
72 ppm/96 hr/mosquito fish/TL<sub>50</sub>/fresh water  
330-1000 ppm/48 hr/cockle/LC<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Various grades: 52-98%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open or pressure-vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material
- 8.2 49 CFR Class: 8
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
| Special (White).....      | OX             |
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCL List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** 192.0°F = 88.9°C = 362.1°K
- 9.4 **Freezing Point:** -50°F = -45.6°C = 227.6°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.49 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.248
- 9.12 **Latent Heat of Vaporization:** 214 Btu/lb = 119 cal/g = 4.98 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -205 Btu/lb = -114 cal/g = -4.76 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 1.9 psia

## NOTES

# NITRIC ACID

NAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	95.139	51	0.470		N		N
40	94.830	52	0.471		O		O
45	94.520	53	0.472		T		T
50	94.209	54	0.472				
55	93.910	55	0.473		P		P
60	93.599	56	0.473		E		E
65	93.290	57	0.474		R		R
70	92.990	58	0.474		T		T
75	92.679	59	0.475		I		I
80	92.370	60	0.475		N		N
85	92.070	61	0.476		E		E
90	91.759	62	0.477		N		N
95	91.450	63	0.477		T		T
		64	0.478				
		65	0.478				
		66	0.479				
		67	0.479				
		68	0.480				
		69	0.480				
		70	0.481				
		71	0.482				
		72	0.482				
		73	0.483				
		74	0.483				
		75	0.484				
		76	0.484				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	80	1.291	80	0.01404	0	0.206
	I	85	1.489	85	0.01605	10	0.209
	S	90	1.713	90	0.01829	20	0.213
	C	95	1.964	95	0.02078	30	0.216
	I	100	2.246	100	0.02355	40	0.219
	B	105	2.560	105	0.02662	50	0.223
	L	110	2.912	110	0.03000	60	0.226
	E	115	3.303	115	0.03374	70	0.229
		120	3.737	120	0.03784	80	0.232
		125	4.218	125	0.04235	90	0.236
		130	4.750	130	0.04728	100	0.239
		135	5.336	135	0.05267	110	0.242
		140	5.981	140	0.05855	120	0.246
		145	6.690	145	0.06494	130	0.249
		150	7.467	150	0.07189	140	0.252
		155	8.317	155	0.07943	150	0.255
		160	9.246	160	0.08758	160	0.259
		165	10.260	165	0.09640	170	0.262
		170	11.360	170	0.10590	180	0.265
		175	12.560	175	0.11610	190	0.269
		180	13.860	180	0.12720	200	0.272
						210	0.275
						220	0.278
						230	0.282
						240	0.285
						250	0.288

# NONYL ACETATE

NAE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetate C-9 Acetic acid, n-nonyl ester Nonanol acetate n-Nonyl acetate	Liquid  Colorless  Pungent odor of mushrooms  Floats on water.
Wear full impervious protective clothing and approved respirator. Restrict access. Shut off ignition sources. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula:  $\text{CH}_3\text{COO}(\text{CH}_2)_9\text{CH}_3$   
 2.3 IMO/UN Designation: Currently not available  
 2.4 DOT ID No.: Not listed.  
 2.5 CAS Registry No.: Currently not available  
 2.6 NAERG Guide No.: Not listed  
 2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.  
 3.2 **Symptoms Following Exposure:** Currently not available  
 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** Currently not available  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
 4.5 **Special Hazards of Combustion**  
 Products: Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
 4.6 **Behavior in Fire:** Currently not available  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Not listed.  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 73.8 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 22.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction.  
 5.2 **Reactivity with Common Materials:** Currently not available  
 5.3 **Stability During Transport:** Stable.  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
 5.5 **Polymerization:** Will not polymerize.  
 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** Currently not available  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: (2)  
 Human Oral hazard: 0  
 Human Contact hazard: -  
 Reduction of amenities: -

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical.  
 7.2 **Storage Temperature:** Ambient.  
 7.3 **Inert Atmosphere:** No requirement.  
 7.4 **Venting:** Not listed.  
 7.5 **IMO Pollution Category:** (C)  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed.  
 8.2 **49 CFR Class:** Not pertinent.  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 186.29  
 9.3 **Boiling Point at 1 atm:** 406.4 - 413.6°F = 208 - 212°C = 481 - 485°K  
 9.4 **Freezing Point:** Currently not available  
 9.5 **Critical Temperature:** Currently not available  
 9.6 **Critical Pressure:** Currently not available  
 9.7 **Specific Gravity:** 0.8785 @ 15°C.  
 9.8 **Liquid Surface Tension:** Currently not available  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
 9.12 **Latent Heat of Vaporization:** Currently not available  
 9.13 **Heat of Combustion:** Currently not available  
 9.14 **Heat of Decomposition:** Currently not available  
 9.15 **Heat of Solution:** Currently not available  
 9.16 **Heat of Polymerization:** Not pertinent.  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# NONYL ACETATE

NAE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
59	7.330		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# 4-NITROANILINE

NAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Amino-4-nitrobenzene Azotic diazo component 37 Fast red GG base Fast red IG base p-Nitroaniline PNA	Solid  Yellow  Mild Odor  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Avoid inhalation. Wear dust respirator. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. If inhaled will cause headache, coughing, difficult breathing, or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause headache, coughing, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge  
Dilute and disperse  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 1, 4-C<sub>6</sub>H<sub>4</sub>NO<sub>2</sub>NH<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/1661  
2.4 DOT ID No.: 1661  
2.5 CAS Registry No.: 100-01-6  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51454

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Bu. Mines dust canister; rubber gloves; chemical safety goggles; face shield; rubber safety shoes
- 3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, drowsiness, shortness of breath, nausea, methemoglobinemia, and unconsciousness; fingernails, lips, and ears become bluish; prolonged and excessive exposures may also cause liver damage. Contact with eyes causes irritation and possible corneal damage. Contact with skin causes irritation; continued exposure may cause same symptoms as inhalation or ingestion.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; administer oxygen if required; get medical attention. INGESTION: induce vomiting; get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water; be sure that no compound remains in the hair or under the fingernails.
- 3.4 TLV-TWA: 3 mg/m<sup>3</sup> (skin)  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: 300 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 1 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 329°F O.C. (molten solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.  
4.6 **Behavior in Fire:** Melts and burns  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 24 ppm\*/daphnia/threshold toxicity/fresh water  
\*Time period not specified.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 100%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 3              |
- 8.6 EPA Reportable Quantity: 5000 pounds  
8.7 EPA Pollution Category: D  
8.8 RCRA Waste Number: P077  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 138.1  
9.3 **Boiling Point at 1 atm:** 636°F = 336°C = 609°K  
9.4 **Freezing Point:** 295°F = 146°C = 419°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.44 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -9,920 Btu/lb = -5,510 cal/g = -231 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 36.50 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 4-NITROANILINE

NAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# NONANE

NAN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Nonane	Liquid	Colorless	Gasoline-like odor
Floats on water.			
Keep people away. Avoid contact with liquid. Avoid inhalation. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea, and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Chemical and Physical Treatment: Burn; Absorb Clean shore line Salvage waterfowl	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 31; Paraffin 2.2 Formula: C <sub>9</sub> H <sub>20</sub> 2.3 IMO/UN Designation: 3.3/1920 2.4 DOT ID No.: 1920 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: 128 2.7 Standard Industrial Trade Classification: 51114
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus for high vapor concentrations; goggles or face shield; rubber gloves. 3.2 <b>Symptoms Following Exposure:</b> Inhalation of concentrated vapor causes depression, irritation of respiratory tract, and pulmonary edema. Liquid can irritate eyes and (on prolonged contact) skin. Ingestion causes irritation of mouth and stomach. Aspiration causes severe lung irritation, rapidly developing pulmonary edema, and central nervous system excitement followed by depression. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove victim from exposure; give artificial respiration if needed. EYES: irrigate with large amounts of water for 15 min. SKIN: flush with water; wash with soap and water. INGESTION: do NOT induce vomiting; call physician. ASPIRATION: enforce bed rest; give oxygen; get medical attention. 3.4 TLV-TWA: 200 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 0; LD <sub>50</sub> >15 g/kg 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat. 3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin. 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 88°F C.C.  
4.2 Flammable Limits in Air: 0.87%-2.9%  
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 401°F  
4.8 Electrical Hazards: Class I, Group D  
4.9 Burning Rate: 5.8 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 66.6 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 19.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 1.1%, 1 day  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: (0)  
Human Contact hazard: 0  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Research, Pure, Technical: all 99.5+%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: (C)  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 128.3  
9.3 Boiling Point at 1 atm: 304°F = 151°C = 424°K  
9.4 Freezing Point: -64.3°F = -53.5°C = 219.7°K  
9.5 Critical Temperature: 610.5°F = 321.4°C = 594.6°K  
9.6 Critical Pressure: 335 psia = 22.8 atm = 2.31 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.718 at 20°C (liquid)  
9.8 Liquid Surface Tension: 22.9 dynes/cm = 0.0229 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 35 dynes/cm = 0.035 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: 4.4  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.042 at 16°C  
9.12 Latent Heat of Vaporization: 127 Btu/lb = 70.6 cal/g = 2.95 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -19,067 Btu/lb = -10,593 cal/g = -443.21 X 10<sup>6</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 28.83 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.2 psia

## NOTES

# NONANE

NAN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	46.820	0	0.526	0	0.973	35	0.942
10	46.530	5	0.528	10	0.964	40	0.902
20	46.230	10	0.530	20	0.954	45	0.865
30	45.940	15	0.532	30	0.945	50	0.830
40	45.640	20	0.535	40	0.935	55	0.797
50	45.350	25	0.537	50	0.925	60	0.766
60	45.050	30	0.539	60	0.916	65	0.737
70	44.760	35	0.541	70	0.906	70	0.709
80	44.470	40	0.544	80	0.897	75	0.683
90	44.170	45	0.546	90	0.887	80	0.659
100	43.880	50	0.548	100	0.877	85	0.635
110	43.580	55	0.550	110	0.868	90	0.613
120	43.290	60	0.552	120	0.858	95	0.592
130	42.990	65	0.555	130	0.849	100	0.573
140	42.700	70	0.557	140	0.839	105	0.554
150	42.400	75	0.559	150	0.830	110	0.536
160	42.110	80	0.561	160	0.820	115	0.519
170	41.810	85	0.564	170	0.810	120	0.502
		90	0.566	180	0.801		
		95	0.568	190	0.791		
		100	0.570	200	0.782		
		105	0.572				
		110	0.575				
		115	0.577				
		120	0.579				
		125	0.581				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.069	70	0.00156	0	0.350
	N	80	0.096	80	0.00212	10	0.355
	S	90	0.131	90	0.00285	20	0.361
	O	100	0.177	100	0.00378	30	0.367
	L	110	0.237	110	0.00496	40	0.373
	U	120	0.313	120	0.00646	50	0.379
	B	130	0.411	130	0.00833	60	0.384
	L	140	0.534	140	0.01064	70	0.390
	E	150	0.688	150	0.01349	80	0.396
		160	0.879	160	0.01696	90	0.402
		170	1.115	170	0.02116	100	0.408
		180	1.403	180	0.02622	110	0.414
		190	1.754	190	0.03227	120	0.419
		200	2.178	200	0.03945	130	0.425
		210	2.686	210	0.04793	140	0.431
		220	3.292	220	0.05789	150	0.437
		230	4.012	230	0.06952	160	0.443
		240	4.861	240	0.08304	170	0.449
		250	5.858	250	0.09867	180	0.454
		260	7.024	260	0.11670	190	0.460
		270	8.379	270	0.13730	200	0.466
		280	9.949	280	0.16080	210	0.472
		290	11.760	290	0.18750	220	0.478
		300	13.840	300	0.21770	230	0.483
						240	0.489
						250	0.495



# 1-NAPHTHYLAMINE

NAO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Aminonaphthalene alpha-Naphthylamine	Solid  Light to dark brown  Weak ammonia-like odor  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Avoid inhalation. Wear dust respirator and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Irritating gases are produced when heated. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge  
Chemical and Physical Treatment:  
Absorb  
Do not burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{10}H_9NH_2$   
2.3 IMO/UN Designation: 6.1/2077  
2.4 DOT ID No.: 2077  
2.5 CAS Registry No.: 134-32-7  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51454

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Complete protection for respiratory system, eyes, and skin  
3.2 **Symptoms Following Exposure:** Inhalation may cause cyanosis (blue color in lips and under finger nails). Contact with liquid causes local irritation of eyes. Neither ingestion nor contact with skin produces any recognized immediate effects.  
3.3 **Treatment of Exposure:** Persons undergoing severe exposure to this compound should have continuing medical attention for possible development of cancer. INHALATION: obtain medical attention for cyanosis. EYES: flush with water for at least 15 min. SKIN: wash carefully with soap and water. INGESTION: get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $LD_{50}$  = 779 mg/kg (rat), 4,000 mg/kg (mammal)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Considered cancer-producing, particularly since it may contain up to 0.5% of 2-naphthylamine.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** (combustible solid) 315°F C.C. (molten solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide, foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Toxic nitrogen oxides are produced in a fire.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 63.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 15.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Pure; Technical  
7.2 **Storage Temperature:** Cool ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open. Store containers in well-ventilated area.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U167  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 143.2  
9.3 **Boiling Point at 1 atm:** 572°F = 300°C = 573°K  
9.4 **Freezing Point:** 118–122°F = 48–50°C = 321–323°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.12 at 25°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** –15,290 Btu/lb = –8,495 cal/g = –355.4 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1-NAPHTHYLAMINE

NAO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T	125	0.811		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.170		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# NICKEL AMMONIUM SULFATE

NAS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium disulfatonickelate (II) Ammonium nickel sulfate Nickel ammonium sulfate hexahydrate	Solid  Dark green-blue  Odorless  Sinks and mixes slowly with water.
Keep people away. Avoid contact with solid and dust. Avoid inhalation. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{NiSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 9138
- 2.5 CAS Registry No.: 15699-18-0
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52349

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Bu. Mines approved respirator; rubber gloves; face shield or safety goggles; protective clothing
- 3.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion causes vomiting. Contact with eyes causes irritation. Contact with skin may cause dermatitis.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air; get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with water for at least 15 min.; get medical attention if irritation persists. SKIN: wash with soap and water.
- 3.4 TLV-TWA: Notice of intended change: 1.5 mg Ni/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5-5 g/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Possible lung cancer
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 10 mg Ni/m<sup>3</sup>
- 3.14 OSHA PEL-TWA: 1 mg/m<sup>3</sup> as nickel
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may be formed in fire.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 6 ppm as Ni/daphnia magna/deleterious effect/fresh water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent; Technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 100 pounds
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 395.00
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.92 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# NICKEL AMMONIUM SULFATE

NAS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	8.450		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# NICKEL BROMIDE

NBR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nickel bromide trihydrate	Solid  Yellowish-green  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Avoid inhalation. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Irritating gases may be produced when heated.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing and difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{NiBr}_2 \cdot 3\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Bu. Mines approved respirator; rubber gloves; face shield or safety goggles; protective clothing.
- 3.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting; if large amount is swallowed and not thrown up, it can cause drowsiness and other symptoms of bromide poisoning. Dust irritates eyes and may cause dermatitis in contact with skin.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air; get medical attention if exposure has been severe. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min. SKIN: wash with soap and water.
- 3.4 TLV-TWA: Notice of intended change: 1.5 mg  $\text{Ni}/\text{m}^3$
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5\text{-}5 \text{ g/kg}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Possible lung cancer
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 10 mg  $\text{Ni}/\text{m}^3$
- 3.14 OSHA PEL-TWA: 1 mg  $\text{m}^3$  as nickel
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Irritating hydrogen bromide vapors may form in fire.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent; Technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 272.6
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: (est.) 4 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# NICKEL BROMIDE

NBR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	200.299		N		N		N
36	201.699		O		O		O
38	203.000		T		T		T
40	204.299						
42	205.699		P		P		P
44	207.000		E		E		E
46	208.299		R		R		R
48	209.699		T		T		T
50	211.000		I		I		I
52	212.299		N		N		N
54	213.699		E		E		E
56	215.000		N		N		N
58	216.299		E		E		E
60	217.699		N		N		N
62	219.000		T		T		T
64	220.299						
66	221.699						
68	223.000						
70	224.299						
72	225.699						
74	227.000						
76	228.299						
78	229.699						
80	231.000						
82	232.299						
84	233.699						

# NICKEL CHLORIDE

NCL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nickel chloride hexahydrate	Solid	Green	Odorless
Sinks and mixes with water.			
Keep people away. Avoid contact with solid and dust. Avoid inhalation. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of wter. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed.
- 2.5 CAS Registry No.: 7718-54-9
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; protective gloves; Bu. Mines approved respirator; protective clothing.
- 3.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting. Dust irritates eyes and may cause dermatitis in contact with skin.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air; get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with plenty of water for at least 15 min. SKIN: flush with water.
- 3.4 TLV-TWA: Notice of intended change: 1.5 mg  $\text{Ni}/\text{m}^3$
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5\text{-}5 \text{ g/kg}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Possible lung cancer
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 10 mg  $\text{Ni}/\text{m}^3$
- 3.14 OSHA PEL-TWA: 1 mg/ $\text{m}^3$  as nickel
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 259 mg/l/minnow fundulus/survived/salt water  
5.18 ppm/96 hr/fathead minnow/TL<sub>50</sub>/soft water  
42.4 ppm/96 hr/fathead minnow/TL<sub>50</sub>/hard water  
\*Time period not specified
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical, 99+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 100 pounds
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 237.7
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 3.55 at 15°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: 8.8 Btu/lb = 4.9 cal/g = 0.21 X 10<sup>4</sup> J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: 142.5 cal/g
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# NICKEL CHLORIDE

NCL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	54.250		N		N		N
36	54.710		O		O		O
38	55.170		T		T		T
40	55.620						
42	56.080		P		P		P
44	56.530		E		E		E
46	56.990		R		R		R
48	57.440		T		T		T
50	57.900		I		I		I
52	58.350		N		N		N
54	58.810		E		E		E
56	59.270		N		N		N
58	59.720		E		E		E
60	60.180		N		N		N
62	60.630		T		T		T
64	61.090						
66	61.540						
68	62.000						
70	62.450						
72	62.910						
74	63.370						
76	63.820						
78	64.280						
80	64.730						
82	65.190						
84	65.639						



# NICKEL CYANIDE

NCN

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Solid	Light green or yellow-brown	Weak almond odor
	Sinks in water.		
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Avoid inhalation. Wear dust respirator and rubber overclothing (including gloves). Stay upwind. Use water spray to "knock down" dust. Notify local health and pollution control agencies. Protect water intakes.			
Fire	Not flammable.		
Exposure	<b>CALL FOR MEDICAL AID.</b> <b>DUST</b> <b>POISONOUS IF INHALED.</b> Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>SOLID</b> <b>POISONOUS IF SWALLOWED.</b> Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 <b>CG Compatibility Group:</b> Not listed. 2.2 <b>Formula:</b> Ni(CN) <sub>2</sub> ·nH <sub>2</sub> O n=0,2,3,4 2.3 <b>IMO/UN Designation:</b> 6.1/1653 2.4 <b>DOT ID No.:</b> 1653 2.5 <b>CAS Registry No.:</b> 557-19-7 2.6 <b>NAERG Guide No.:</b> 151 2.7 <b>Standard Industrial Trade Classification:</b> 52381
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Dust mask; rubber gloves; goggles. 3.2 <b>Symptoms Following Exposure:</b> Inhalation of dust or ingestion can produce bitter taste, salivation, numbness of throat, anxiety, irregular respiration, rapid pulse, convulsions, loss of consciousness, paralysis, death. 3.3 <b>Treatment of Exposure:</b> Get medical help; first-aid treatment must be prompt; the compound is much less soluble than sodium or potassium cyanides, but cyanide poisoning is a possibility. EYES or SKIN: flush with water; avoid getting solution in mouth. INGESTION: start artificial respiration if breathing has stopped; inhalation of amyl nitrite and intravenous doses of sodium nitrite and sodium thiosulfate should be administered by physician. 3.4 <b>TLV-TWA:</b> Notice of intended change: 1.5 mg Ni/m <sup>3</sup> 3.5 <b>TLV-STEL:</b> 5 mg/m <sup>3</sup> for 30 min. (as cyanide) 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Currently not available 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 10 mg Ni/m <sup>3</sup> 3.14 <b>OSHA PEL-TWA:</b> 1 mg/m <sup>3</sup> as nickel 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
>100 mg/l/fish/harmless/moderately alkaline water  
In acid water, releases hydrogen cyanide, which is fatal to all species.  
\*Time period not specified.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Sealed containers in well-ventilated area.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** P074
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** Mixture
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.4 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# NICKEL CYANIDE

NCN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
64	0.006		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# NICOTINE SULFATE

NCS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Black leaf 40 (40% water solution) Neutral nicotine sulfate	Solid or solution	White to light brown solid or colorless solution	Odorless solid or tobacco odored solution
	Mixes with water.		
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND SOLID.</b> Avoid inhalation. Wear goggles and dust respirator. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR OR DUST POISONOUS IF INHALED. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:** (C<sub>10</sub>H<sub>14</sub>N<sub>2</sub>)<sub>2</sub>·H<sub>2</sub>SO<sub>4</sub>
- 2.3 **IMO/UN Designation:** 6.1/1658
- 2.4 **DOT ID No.:** 1658
- 2.5 **CAS Registry No.:** 65-30-5
- 2.6 **NAERG Guide No.:** 151
- 2.7 **Standard Industrial Trade Classification:** 51577

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose and throat. Liquid irritates eyes and (on prolonged contact) skin. Ingestion causes burning of mouth and stomach, vomiting, excitement, faintness, paralysis of lungs.
- 3.3 **Treatment of Exposure:** EYES: flush with water. SKIN: wash thoroughly and immediately with water. INGESTION: call for medical aid; induce immediate and repeated vomiting; perform gastric lavage with dilute (1:10,000) solution of potassium permanganate or activated charcoal in water or milk; apply artificial respiration if breathing has stopped.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 55 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless solid
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Nonflammable as solid or water solution.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic decomposition products are released in a fire.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
3-29 ppm"/fish/toxic/fresh water (for nicotine)  
\*Time period not specified.
- 6.2 **Waterfowl Toxicity:** LD<sub>50</sub> = 587 mg/kg (for nicotine)
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Solid: Commercial; Solution: 40%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 422.5
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.15 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# NICOTINE SULFATE

NCS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# NAPHTHA: COAL TAR

NCT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Mixture of benzene, toluene, xylenes		Watery liquid	Colorless to pale yellow	Gasoline-like odor
		Floats on water. Irritating vapor is produced.		
<p>Keep people away.</p> <p>Avoid inhalation.</p> <p>Shut off ignition sources and call fire department.</p> <p>Avoid contact with liquid and vapor.</p> <p>Stay upwind and use water spray to "knock down" vapor.</p> <p>Notify local health and pollution control agencies.</p> <p>Protect water intakes.</p>				
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical or carbon dioxide. Cool exposed containers with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33; Miscellaneous Hydrocarbon Mixtures
- 2.2 Formula: Currently not available
- 2.3 IMO/UN Designation: 3.2/2553
- 2.4 DOT ID No.: 1268
- 2.5 CAS Registry No.: MX8030-31-7
- 2.6 NAERG Guide No.: 128
- 2.7 Standard Industrial Trade Classification: 33429

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Hydrocarbon vapor canister or air pack; plastic gloves; goggles or face shield.
- 3.2 **Symptoms Following Exposure:** Primarily a narcotic, causing unconsciousness in high concentrations. The symptoms of acute benzene poisoning are not likely, since the compound has components other than benzene.
- 3.3 **Treatment of Exposure:** Remove from exposure. Support respiration. Call physician.
- 3.4 **TLV-TWA:** 400 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Leukemia
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause a smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 4.68 ppm
- 3.13 **IDLH Value:** 1,000 ppm
- 3.14 **OSHA PEL-TWA:** 100 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 107°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 900–950°F
- 4.8 **Electrical Hazards:** Class I, Group D
- 4.9 **Burning Rate:** 4 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Purity varies with coal used and distillation range taken.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** 200–500°F = 93–260°C = 366–533°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.86–0.88 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 45 dynes/cm = 0.045 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.030
- 9.12 **Latent Heat of Vaporization:** (est.) 101 Btu/lb = 56.2 cal/g = 2.35 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** (est.) –18,200 Btu/lb = –10,100 cal/g = –424 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.13 psia

### NOTES

# NAPHTHA: COAL TAR

NCT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	53.680	50	0.478	50	1.040	50	9.343
52	53.680	52	0.478	52	1.040	52	8.841
54	53.680	54	0.478	54	1.040	54	8.370
56	53.680	56	0.478	56	1.040	56	7.927
58	53.680	58	0.478	58	1.040	58	7.511
60	53.680	60	0.478	60	1.040	60	7.119
62	53.680	62	0.478	62	1.040	62	6.751
64	53.680	64	0.478	64	1.040	64	6.404
66	53.680	66	0.478	66	1.040	66	6.078
68	53.680	68	0.478	68	1.040	68	5.770
70	53.680	70	0.478	70	1.040	70	5.481
72	53.680	72	0.478	72	1.040	72	5.207
74	53.680	74	0.478	74	1.040	74	4.950
76	53.680	76	0.478	76	1.040	76	4.707
78	53.680	78	0.478	78	1.040	78	4.477
80	53.680	80	0.478	80	1.040	80	4.260
82	53.680	82	0.478	82	1.040	82	4.056
84	53.680	84	0.478	84	1.040	84	3.862
86	53.680	86	0.478	86	1.040	86	3.679
88	53.680	88	0.478	88	1.040	88	3.506
90	53.680	90	0.478	90	1.040	90	3.342
92	53.680	92	0.478	92	1.040	92	3.187
94	53.680	94	0.478	94	1.040	94	3.040
96	53.680	96	0.478	96	1.040	96	2.901
98	53.680	98	0.478	98	1.040	98	2.770
100	53.680	100	0.478	100	1.040	100	2.645

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	90	0.094		N		C
	N	100	0.124		O		U
	S	110	0.163		T		R
	O	120	0.211				R
	L	130	0.272		P		E
	U	140	0.347		E		N
	B	150	0.440		R		T
	L	160	0.553		T		L
	E	170	0.691		I		Y
		180	0.856		N		
		190	1.054		E		N
		200	1.290		N		O
		210	1.569		T		T
		220	1.897				
		230	2.281				A
		240	2.728				V
		250	3.247				A
		260	3.846				I
		270	4.535				L
		280	5.323				A
		290	6.221				B
		300	7.241				L
		310	8.394				E
		320	9.695				
		330	11.160				
		340	12.790				

# NEODECANOIC ACID

NEA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,2-Dimethyl octanoic acid	Liquid	Colorless
Avoid contact with liquid and vapor. Keep people away. Wear protective clothing. Call fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> and/or water sprays. Use water spray to cool fire exposed surfaces and to protect personnel.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, induce vomiting.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 4; Organic acids.  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_8\text{C}(\text{CH}_3)_2\text{COOH}$   
2.3 IMO/UN Designation: UN 1760  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 26896-20-8  
2.6 NAERG Guide No.: Not listed.  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** When contact is likely wear long sleeves, chemical resistant gloves, and chemical goggles. Where contact may occur wear safety glasses with side shields. Where overexposure by inhalation may occur, wear approved respirator.
- 3.2 **Symptoms Following Exposure:** Irritating to eyes and respiratory tract in high concentrations. May cause hair disorder or damage.
- 3.3 **Treatment of Exposure:** INHALATION: Use proper respiratory protection. Remove the victim from the exposure. Administer artificial respiration if breathing stops. Keep at rest. Call for prompt medical attention. INGESTION: If conscious, INDUCE VOMITING, get prompt medical attention. If unconscious, do not give anything by mouth. SKIN: Flush with large amount of water. Use soap if available. EYES: Immediately flush with large amounts of water. Get prompt medical attention.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors/mists cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 201°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Water spray, alcohol foam or dry chemical.  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Flammable toxic gas may be released, if thermally decomposed.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 66.6 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 20.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: May corrode metals.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Sodium bicarbonate or lime.  
5.5 Polymerization: Will not occur  
5.6 Inhibitor of Polymerization: Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 79-100%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: C  
7.6 Ship Type: 2  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.  
8.2 49 CFR Class: Not pertinent.  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 172.27  
9.3 Boiling Point at 1 atm: 482-494°F = 250-256.7°C = 523.2-529.9°K  
9.4 Freezing Point: <104°F = <40°C = <313.2°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 0.92  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 6.0  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# NEODECANOIC ACID

NEA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	68	35.800

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	N E G L I G I B L E	284 367	0.276 1.929		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.313 0.327 0.341 0.355 0.369 0.382 0.395 0.407 0.420 0.432 0.444 0.456 0.467 0.478 0.489 0.500 0.510 0.521 0.531 0.540 0.550 0.559 0.569 0.578 0.586



# NICKEL FLUOROBORATE

NFB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nickel (II) fluoroborate Nickel fluoroborate solution	Liquid Green  Sink and mixes with water.
Keep people away. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:** Ni(BF<sub>4</sub>)<sub>2</sub>·H<sub>2</sub>O
- 2.3 **IMO/UN Designation:** Not listed
- 2.4 **DOT ID No.:** Not listed
- 2.5 **CAS Registry No.:** Currently not available
- 2.6 **NAERG Guide No.:** Not listed
- 2.7 **Standard Industrial Trade Classification:** 52384

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses and face shield; rubber gloves; rubber apron
- 3.2 **Symptoms Following Exposure:** Ingestion causes irritation of mouth and stomach. Liquid irritates eyes and skin and may cause dermatitis.
- 3.3 **Treatment of Exposure:** INGESTION: give large amount of water; induce vomiting; get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water.
- 3.4 **TLV-TWA:** Notice of intended change: 1.5 mg Ni/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Possible lung cancer
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 10 mg Ni/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 1 mg/m<sup>3</sup> as nickel
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 44.2-45.2% in water
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Mixture
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.5 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# NICKEL FLUOROBORATE

NFB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	93.629		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# NICKEL FORMATE

NFM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nickel formate dihydrate	Solid  Green  Odorless   Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Ni}(\text{HCO}_2)_2 \cdot 2\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51374

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Bu. Mines approved respirator; rubber gloves; face shield or safety goggles; protective clothing
- 3.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting. Dust irritates eyes and may cause dermatitis in contact with skin.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air; get medical attention if exposure has been severe. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min. SKIN: flush with water.
- 3.4 TLV-TWA: Notice of intended change: 1.5 mg Ni/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5-5 g/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Possible lung cancer
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 10 mg Ni/m<sup>3</sup>
- 3.14 OSHA PEL-TWA: 1 mg/m<sup>3</sup> as nickel
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion  
Products: Irritating formic acid vapors may form in fire.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 184.8
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.15 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# NICKEL FORMATE

NFM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	3.061		N		N		N
36	3.072		O		O		O
38	3.083		T		T		T
40	3.094						
42	3.106		P		P		P
44	3.117		E		E		E
46	3.128		R		R		R
48	3.139		T		T		T
50	3.150		I		I		I
52	3.161		N		N		N
54	3.172		E		E		E
56	3.183		N		N		N
58	3.194		E		E		E
60	3.206		N		N		N
62	3.217		T		T		T
64	3.228						
66	3.239						
68	3.250						
70	3.261						
72	3.272						
74	3.283						
76	3.294						
78	3.306						
80	3.317						
82	3.328						
84	3.339						

## NEOHEXANE

NHX

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms 2,2-Dimethylbutane		Liquid	Colorless	Gasoline-like odor
Floats on water. Flammable, irritating vapor is produced.				
Evacuate. Keep people away. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.				
Fire	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.			
Exposure	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, coughing, or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea, or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators or nearby water intakes.			

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Pump or dredge sediment if contaminated  
Chemical and Physical Treatment: Burn;  
Absorb

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{C}(\text{CH}_3)_2\text{CH}_2\text{CH}_3$   
2.3 IMO/UN Designation: 3.1/1208  
2.4 DOT ID No.: 1208  
2.5 CAS Registry No.: 75-83-2  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51114

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied apparatus or organic vapor cartridge; goggles or face shield; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Inhalation causes dizziness, nausea, and vomiting; concentrated vapor may cause unconsciousness and collapse. Contact with liquid causes irritation of eyes; repeated contact may produce irritation of skin. Ingestion causes irritation of stomach. Aspiration causes severe lung irritation, rapidly developing pulmonary edema, and central nervous system excitement followed by depression.
- 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; if breathing has stopped, begin artificial respiration; call a physician. EYES: flush with water for 15 min.; call physician if needed. SKIN: flush well with water, then wash with soap and water. INGESTION: do NOT induce vomiting; guard against aspiration into lungs; call a doctor. ASPIRATION: enforce bed rest; give oxygen; get medical attention.
- 3.4 TLV-TWA: 500 ppm  
3.5 TLV-STEL: 1,000 ppm  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: -54°F C.C.  
4.2 Flammable Limits in Air: 1.2%-7.7%  
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 797°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: 9.2 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 45.2 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 13.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Research: 99.98%; Pure: 99.5%; Technical: 96.4%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 86.2  
9.3 Boiling Point at 1 atm: 121.5°F = 49.7°C = 322.9°K  
9.4 Freezing Point: -147.8°F = -99.9°C = 173.3°K  
9.5 Critical Temperature: 420.1°F = 215.6°C = 488.8°K  
9.6 Critical Pressure: 447 psia = 30.4 atm = 3.08 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.649 at 20°C (liquid)  
9.8 Liquid Surface Tension: 16.3 dynes/cm = 0.0163 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 35 dynes/cm = 0.035 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: 3.0  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.064 at 16°C  
9.12 Latent Heat of Vaporization: 131 Btu/lb = 72.9 cal/g = 3.05 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -19,310 Btu/lb = -10,730 cal/g = -448.9 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 1.61 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# NEOHEXANE

NHX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	41.690	34	0.502	72	0.705	34	0.457
36	41.620	36	0.503	74	0.702	36	0.451
38	41.550	38	0.504	76	0.700	38	0.446
40	41.480	40	0.505	78	0.698	40	0.440
42	41.410	42	0.507	80	0.696	42	0.435
44	41.340	44	0.508	82	0.693	44	0.430
46	41.270	46	0.509	84	0.691	46	0.425
48	41.210	48	0.510	86	0.689	48	0.420
50	41.140	50	0.511	88	0.687	50	0.415
52	41.070	52	0.512	90	0.684	52	0.410
54	41.000	54	0.513	92	0.682	54	0.405
56	40.930	56	0.514	94	0.680	56	0.400
58	40.860	58	0.515	96	0.678	58	0.396
60	40.790	60	0.517	98	0.676	60	0.391
62	40.720	62	0.518	100	0.673	62	0.387
64	40.650	64	0.519	102	0.671	64	0.383
66	40.580	66	0.520	104	0.669	66	0.379
68	40.510	68	0.521	106	0.667	68	0.374
70	40.440	70	0.522	108	0.664	70	0.370
72	40.370	72	0.523	110	0.662	72	0.366
74	40.300	74	0.524	112	0.660	74	0.362
76	40.230	76	0.525	114	0.658	76	0.359
78	40.170	78	0.527	116	0.655	78	0.355
80	40.100	80	0.528			80	0.351
82	40.030	82	0.529			82	0.347
84	39.960	84	0.530			84	0.344

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	-20	0.443	-20	0.00809	0	0.346
	N	-10	0.619	-10	0.01105	10	0.352
	S	0	0.850	0	0.01485	20	0.358
	O	10	1.149	10	0.01965	30	0.364
	L	20	1.530	20	0.02561	40	0.370
	U	30	2.009	30	0.03294	50	0.377
	B	40	2.603	40	0.04183	60	0.383
	L	50	3.333	50	0.05252	70	0.389
	E	60	4.221	60	0.06522	80	0.395
		70	5.289	70	0.08018	90	0.401
		80	6.563	80	0.09765	100	0.407
		90	8.069	90	0.11790	110	0.414
		100	9.836	100	0.14110	120	0.420
		110	11.890	110	0.16760	130	0.426
		120	14.270	120	0.19770	140	0.432
		130	17.010	130	0.23160	150	0.438
		140	20.130	140	0.26950	160	0.445
						170	0.451
						180	0.457
						190	0.463
						200	0.469
						210	0.476
						220	0.482
						230	0.488
						240	0.494
						250	0.500

# NICOTINE

NIC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Methyl-2-(3-pyridyl)pyrrolidine 3-(1-Methyl-2-pyrrolidyl)pyridine	Liquid	Colorless to brown	Fishy odor
Mixes with water.			
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID.</b> Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> Not listed. <b>2.2 Formula:</b> C <sub>10</sub> H <sub>14</sub> N <sub>2</sub> <b>2.3 IMO/UN Designation:</b> 6.1/1654 <b>2.4 DOT ID No.:</b> 1654 <b>2.5 CAS Registry No.:</b> 54-11-5 <b>2.6 NAERG Guide No.:</b> 151 <b>2.7 Standard Industrial Trade Classification:</b> 51577
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Goggles or face shield; rubber gloves; protective clothing <b>3.2 Symptoms Following Exposure:</b> Inhalation causes burning sensation in mouth and throat, nausea, headache, confusion, visual disturbances. Contact with liquid irritates eyes and causes local irritation of skin. Can be absorbed through skin in toxic amounts. Ingestion causes burning of mouth and stomach, vomiting, excitement, faintness, paralysis of lungs. <b>3.3 Treatment of Exposure:</b> Speed of treatment is important following exposure to this compound. Ingestion of as little as 40 mg can be fatal. EYES: flush with water for at least 15 min. SKIN: wash thoroughly and immediately with cold water. INGESTION: call for physician at once; give 6-8 tablespoons of activated charcoal as a slurry in water; give artificial respiration if breathing has stopped. <b>3.4 TLV-TWA:</b> 0.5 mg/m <sup>3</sup> <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 4; oral LD <sub>50</sub> = 53 mg/kg (rat), 1 mg/kg (human) <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Birth defects (skeletal) in rats <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors are nonirritating to eyes and throat. <b>3.11 Liquid or Solid Characteristics:</b> No appreciable hazard. Practically harmless to the skin. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> 5 mg/m <sup>3</sup> <b>3.14 OSHA PEL-TWA:</b> 0.5 mg/m <sup>3</sup> <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** Currently not available  
**4.2 Flammable Limits in Air:** 0.7%-4.0%  
**4.3 Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
**4.5 Special Hazards of Combustion Products:** Smoke may contain toxic vapors of unburned compound.  
**4.6 Behavior in Fire:** Not pertinent  
**4.7 Auto Ignition Temperature:** 471°F  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 73.8 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 19.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** 3-29 ppm/fish/toxic/fresh water  
\*Time period not specified.  
**6.2 Waterfowl Toxicity:** LD<sub>50</sub> = 587 mg/kg  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 93-98%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Pressure-vacuum  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Poison  
**8.2 49 CFR Class:** 6.1  
**8.3 49 CFR Package Group:** II  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	1
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** P075  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 162.2  
**9.3 Boiling Point at 1 atm:** (decomposes) 482°F = 250°C = 523°K  
**9.4 Freezing Point:** Not pertinent  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 1.016 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** 38.61 dynes/cm = 0.03861 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
**9.12 Latent Heat of Vaporization:** Not pertinent  
**9.13 Heat of Combustion:** -15,836 Btu/lb = -8,798 cal/g = -368.1 X 10<sup>3</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# NICOTINE

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
28	64.410	34	0.420	34	1.048	65	4.714
30	64.360	36	0.420	36	1.048	70	4.348
32	64.299	38	0.420	38	1.048	75	4.017
34	64.240	40	0.420	40	1.048	80	3.716
36	64.190	42	0.420	42	1.048	85	3.442
38	64.129	44	0.420	44	1.048	90	3.193
40	64.080	46	0.420	46	1.048	95	2.967
42	64.020	48	0.420	48	1.048	100	2.759
44	63.970	50	0.420	50	1.048	105	2.570
46	63.910	52	0.420	52	1.048	110	2.397
48	63.860	54	0.420	54	1.048	115	2.238
50	63.800	56	0.420	56	1.048	120	2.092
52	63.740	58	0.420	58	1.048	125	1.958
54	63.690	60	0.420	60	1.048		
56	63.630	62	0.420	62	1.048		
58	63.580	64	0.420	64	1.048		
60	63.520	66	0.420	66	1.048		
62	63.470	68	0.420	68	1.048		
64	63.410	70	0.420	70	1.048		
66	63.360	72	0.420	72	1.048		
68	63.300	74	0.420	74	1.048		
70	63.250	76	0.420	76	1.048		
		78	0.420	78	1.048		
		80	0.420	80	1.048		
		82	0.420	82	1.048		
		84	0.420	84	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	220	0.251	220	0.00559		N
	I	230	0.311	230	0.00681		O
	S	240	0.382	240	0.00824		T
	C	250	0.466	250	0.00993		
	I	260	0.567	260	0.01190		P
	B	270	0.685	270	0.01418		E
	L	280	0.823	280	0.01681		R
	E	290	0.985	290	0.01985		T
		300	1.172	300	0.02332		I
		310	1.390	310	0.02728		N
		320	1.640	320	0.03178		E
		330	1.927	330	0.03687		N
		340	2.255	340	0.04262		T
		350	2.630	350	0.04907		
		360	3.054	360	0.05630		
		370	3.535	370	0.06438		
		380	4.077	380	0.07336		
		390	4.686	390	0.08333		
		400	5.369	400	0.09437		
		410	6.132	410	0.10650		
		420	6.983	420	0.11990		
		430	7.928	430	0.13460		
		440	8.976	440	0.15080		
		450	10.130	450	0.16830		
		460	11.410	460	0.18750		
		470	12.820	470	0.20840		



# O-NITROTOLUENE

NIE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Methyl nitrobenzene 2-Nitrotoluene Toluene, o-nitro	Oily liquid  Light yellow    Sinks in water.	Characteristic aromatic nitro compound odor
<b>Fire</b> Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.  Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with water spray, carbon dioxide, or dry chemical.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR If inhaled, may cause headache, dizziness, nausea, vomiting, and difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID If swallowed or skin is exposed, may cause headache, dizziness, nausea, vomiting, and difficult breathing. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 42; Nitrocompound 2.2 Formula: C <sub>7</sub> H <sub>7</sub> NO <sub>2</sub> 2.3 IMO/UN Designation: 6.1/1664 2.4 DOT ID No.: 1664 2.5 CAS Registry No.: 88-72-2 2.6 NAERG Guide No.: 152 2.7 Standard Industrial Trade Classification: 51140
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Wear butyl rubber gloves, protective working clothes, self-contained breathing apparatus, and protective shoes. 3.2 <b>Symptoms Following Exposure:</b> INHALATION, INGESTION, OR SKIN: Headache, flushing of face, dizziness, dyspnea (difficult breathing), cyanosis, nausea, vomiting, muscular weakness, increased pulse and respiratory rate, irritability, and convulsions. SKIN: Irritation. 3.3 <b>Treatment of Exposure:</b> Call a physician. INHALATION: Remove from source of exposure and rest. EYES: Wash with cold water. SKIN: Wash and scrub body surface including ear canals and nails. INGESTION: Gastric lavage followed by saline catharsis. Get medical aid. 3.4 TLV-TWA: 2 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> 0.5 to 5 g/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Chronic exposure may produce a reversible anemia. Increased number of leucocytes and methemoglobin blood level, decreased number of erythrocytes and hemoglobin level. Impaired function of liver. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> No appreciable hazard. Practically harmless to skin. 3.12 <b>Odor Threshold:</b> 0.05 mg/l. 3.13 <b>IDLH Value:</b> 200 ppm 3.14 <b>OSHA PEL-TWA:</b> 5 ppm 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 203°F O.C. 223°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, CO<sub>2</sub>, and dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Toxic fumes may be generated.  
4.6 **Behavior in Fire:** Generates toxic fumes.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 41.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Will not occur  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
18 to 20 ppm/6-hour/TL<sub>m</sub>/Minnow/distilled water  
35 to 40 ppm/6-hour/TL<sub>m</sub>/Minnow/hard water  
10 to 100 ppm/96-hour/TL<sub>m</sub>/Finfish  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: (T)  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 99.5%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 1

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	4

  
8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 137.13  
9.3 **Boiling Point at 1 atm:** 431.6°F = 222°C = 495.2°K  
9.4 **Freezing Point:** 14°F = -10°C = 263.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.1622 at 19°C/15°C  
9.8 **Liquid Surface Tension:** 42.29 dynes/cm = 0.04229 N/m at 15°C 41.67 dynes/cm = 0.04167 N/m at 20°C 40.50 dynes/cm = 0.04050 N/m at 30°C 41.76 dynes/cm = 0.04176 N/m at 19.5°C  
9.9 **Liquid Water Interfacial Tension:** 27.19 dynes/cm = 0.02719 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 4.72  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 151 Btu/lb = 83.8 cal/g = 3.5 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -11,290 Btu/lb = -6,272 cal/g = -262 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

## NOTES

# O-NITROTOLUENE

NIE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	73.530	C U R R E N T L Y  N O T  A V A I L A B L E		68	1.033	40	3.314
50	73.191					50	2.950
60	72.853					60	2.652
70	72.514					70	2.400
80	72.174					80	2.181
90	71.835					90	1.989
100	71.497					100	1.817
110	71.158					110	1.661
120	70.818					120	1.519
130	70.480					130	1.388
140	70.141					140	1.267
150	69.801					150	1.154
160	69.462					160	1.049
170	69.124					170	0.950
180	68.785					180	0.856
190	68.445					190	0.768
200	68.106					200	0.684
210	67.768					210	0.604

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
86	0.065	50	0.003	50	0.00006	C U R R E N T L Y  N O T  A V A I L A B L E	
		55	0.003	55	0.00008		
		60	0.004	60	0.00009		
		65	0.004	65	0.00010		
		70	0.005	70	0.00012		
		75	0.006	75	0.00014		
		80	0.007	80	0.00017		
		85	0.009	85	0.00020		
		90	0.010	90	0.00023		
		95	0.012	95	0.00028		
		100	0.014	100	0.00032		
		105	0.017	105	0.00038		
		110	0.020	110	0.00045		
		115	0.024	115	0.00053		
		120	0.028	120	0.00062		
		125	0.033	125	0.00073		
		130	0.039	130	0.00085		
		135	0.047	135	0.00100		
		140	0.055	140	0.00118		

# 3-NITROPHENOL

NIP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 3-Hydroxynitrobenzene m-Hydroxynitrobenzene m-Nitrophenol		Crystalline solid      Colorless to pale yellow
		Sinks and mixes with water.
Keep people away. Avoid contact with solid, dust and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Fire data not available. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR DUST If inhaled, swallowed, or if skin is exposed, may cause headache, lethargy, nausea, and cyanosis. Irritating to eyes. Move to fresh air. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $\text{HOC}_6\text{H}_4\text{NO}_2$ 2.3 IMO/UN Designation: 6.1/1663 2.4 DOT ID No.: 1663 2.5 CAS Registry No.: 554-84-7 2.6 NAERG Guide No.: 153 2.7 Standard Industrial Trade Classification: 51243
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Wear butyl rubber gloves, protective clothing and shoes, and self-contained breathing apparatus. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Inhalation or ingestion causes headaches, drowsiness, nausea, and blue color in lips, ears, and finger nails (cyanosis). EYES: Contact with eyes causes irritation. SKIN: Can be absorbed through intact skin to give same symptoms as for inhalation. 3.3 <b>Treatment of Exposure:</b> Call a physician. INHALATION: Remove victim to fresh air; give artificial respiration if needed. EYES: Flush with water for 15 minutes. SKIN: Wash contaminated areas with soap and water. INGESTION: Remove by gastric lavage or emesis and catharsis. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; $\text{LD}_{50} = 0.5$ to 5 g/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Chronic exposure adversely affects the neurohumoral regulation. Higher doses affect activity of all organs and systems such as gastritis, enteritis, colitis, hepatitis, neuritis, hyperplasia of the spleen, and hinders oxidation processes. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Limit concentration-acceptable odor concentration = 350.3 mg/l. 3.13 <b>IDLH Value:</b> Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (solid).
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Currently not available
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Dangerous toxic fumes of  $\text{NO}_x$ .
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 32.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Separate from combustible, organic, or other readily oxidizable materials.
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
9 to 10 ppm/6-hour/MLD/Minnow/distilled water/22°C  
20 to 22 ppm/6-hour/MLD/Minnow/hard water/22°C
- 6.2 **Waterfowl Toxicity:** Waterfowl should not be exposed to more than 25 ppm.
- 6.3 **Biological Oxygen Demand (BOD):**  
4.2%, 0.94 days
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 139.11
- 9.3 **Boiling Point at 1 atm:** At 70 mm Hg 381.2°F = 194°C = 467.2°K
- 9.4 **Freezing Point:** 206.6°F = 97°C = 370.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.485 at 20°C 1.2797 at 100°C (Liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 4.8 (Calculated)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** -8515 Btu/lb = -4731 cal/g = -198 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# 3-NITROPHENOL

NIP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
212	79.889		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
70 80 90 100 110 120 130 140 150 160 170 180 190 200	1.377 1.755 2.235 2.848 3.628 4.621 5.887 7.500 9.555 12.172 15.506 19.754 25.165 32.059	381	1.354		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# NICKEL ACETATE

NKA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, nickel (II) salt Nickel acetate tetrahydrate Nickelous acetate	Solid Dull green Odorless  Sinks and mixes slowly with water.
Keep people away. Avoid contact with solid and dust. Avoid inhalation. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Ni}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 4\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 373-02-4
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Bu. Mines approved respirator; rubber gloves; safety goggles; protective clothing
- 3.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion causes vomiting. Contact with eyes causes irritation. May cause dermatitis in contact with skin.
- 3.3 Treatment of Exposure: INHALATION: remove to fresh air; get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with water 15 min.; consult physician if irritation persists. SKIN: wash with soap and water.
- 3.4 TLV-TWA: Notice of intended change: 1.5 mg Ni/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5-5g/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Possible lung cancer
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 10 mg Ni/m<sup>3</sup>
- 3.14 OSHA PEL-TWA: 1 mg/m<sup>3</sup> as nickel
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 99%; Reagent
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 248.86
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.74 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# NICKEL ACETATE

NKA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	17.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# NICKEL CARBONYL

NKC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nickel tetracarbonyl	Liquid  Colorless to yellow  Musty, stale odor  Sinks in water. Poisonous, flammable vapor is produced.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Evacuate area in case of large discharge. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Cool exposed containers with water. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: Ni(CO) <sub>4</sub> 2.3 IMO/UN Designation: 3.1/1259 2.4 DOT ID No.: 1259 2.5 CAS Registry No.: 13463-39-3 2.6 NAERG Guide No.: 131 2.7 Standard Industrial Trade Classification: 52499
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus; complete protective clothing 3.2 <b>Symptoms Following Exposure:</b> Inhalation causes giddiness, headache, shortness of breath, vomiting; if victim is removed from exposure, symptoms may disappear but recur 12-36 hours later, along with blue pallor of skin, fever, and cough; death may occur. Ingestion or contact with skin may also produce these symptoms. Abnormal nickel content of urine and blood is a measure of the severity of exposure. Contact of liquid with eyes causes severe irritation. 3.3 <b>Treatment of Exposure:</b> Medical help must be obtained following all exposures to vapor or liquid INHALATION: oral administration of sodium diethyldithiocarbamate trihydrate (Dithiocarb); complete bed rest and positive-pressure oxygen are indicated for pulmonary edema; treatment otherwise is symptomatic. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: do NOT induce vomiting. 3.4 TLV-TWA: 0.05 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Currently not available 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: May produce cancer 3.10 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes. 3.12 Odor Threshold: 1-3 ppm 3.13 IDLH Value: 2 ppm 3.14 OSHA PEL-TWA: 0.001 ppm 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: <-4°F C.C.  
4.2 Flammable Limits in Air: 2% (LFL)  
4.3 Fire Extinguishing Agents: Water  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Unusually toxic gases formed by incomplete combustion.  
4.6 Behavior in Fire: Containers may explode when heated.  
4.7 Auto Ignition Temperature: <200°F (vapor)  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: 2.7 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 11.9 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 5.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable below 100°C  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: (3)  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99.9+%  
7.2 Storage Temperature: Cool ambient  
7.3 Inert Atmosphere: Carbon monoxide at 15 psi; carbon dioxide  
7.4 Venting: Cylinders must be stored in a well-ventilated area.  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	3
Instability (Yellow).....	3

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: P073  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 170.7  
9.3 Boiling Point at 1 atm: 109°F = 43°C = 316°K  
9.4 Freezing Point: -13°F = 25°C = 248°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.322 at 17°C (liquid)  
9.8 Liquid Surface Tension: 15.9 dynes/cm = 0.0159 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 5.9  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: 72 Btu/lb = 40 cal/g = 1.7 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -2,970 Btu/lb = -1,650 cal/g = -69.0 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# NICKEL CARBONYL

NKC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	83.299	34	0.286		N	42	0.742
44	83.230	36	0.286		O	44	0.733
46	83.160	38	0.286		T	46	0.724
48	83.089	40	0.287			48	0.715
50	83.020	42	0.287		P	50	0.706
52	82.950	44	0.287		E	52	0.698
54	82.879	46	0.287		R	54	0.690
56	82.809	48	0.287		T	56	0.682
58	82.740	50	0.287		I	58	0.674
60	82.669	52	0.288		N	60	0.666
62	82.610	54	0.288		E	62	0.658
64	82.540	56	0.288		N	64	0.651
66	82.469	58	0.288		T	66	0.643
68	82.400	60	0.288			68	0.636
70	82.330	62	0.288			70	0.629
72	82.259	64	0.289			72	0.622
74	82.190	66	0.289			74	0.615
76	82.120	68	0.289			76	0.609
		70	0.289				
		72	0.289				
		74	0.289				
		76	0.290				
		78	0.290				
		80	0.290				
		82	0.290				
		84	0.290				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
49	0.018	35	2.878	35	0.09251		N
		40	3.260	40	0.10380		O
		45	3.684	45	0.11610		T
		50	4.153	50	0.12960		
		55	4.671	55	0.14430		P
		60	5.242	60	0.16040		E
		65	5.869	65	0.17790		R
		70	6.558	70	0.19690		T
		75	7.312	75	0.21750		I
		80	8.136	80	0.23970		N
		85	9.036	85	0.26380		E
		90	10.020	90	0.28980		N
		95	11.080	95	0.31770		T
		100	12.240	100	0.34770		
		105	13.490	105	0.38000		
		110	14.850	110	0.41450		
		115	16.310	115	0.45150		
		120	17.900	120	0.49090		



# NICKEL HYDROXIDE

NKH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Green nickel oxide Nickel dihydroxide Nickelous hydroxide	Solid crystal      Green  Sinks in water.
Keep people away. Wear goggles, self-contained breathing apparatus, and rubber gloves. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE. Ignites in air at approximately 400°C (752°F).
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST OR SOLID Irritating to eyes, nose, and throat. Harmful if swallowed. Move to fresh air. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $\text{Ni}(\text{OH})_2 \cdot \text{H}_2\text{O}$ $\text{Ni}(\text{OH})_2$ 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 9140 2.5 CAS Registry No.: 12054-48-7 2.6 NAERG Guide No.: 154 2.7 Standard Industrial Trade Classification: 52269
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> NIOSH-approved respiratory protection, side shield safety glasses or goggles, and rubber gloves. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Irritant to mucous membrane of upper respiratory tract. EYES: Irritant to conjunctiva. SKIN: May cause sensitization. Sensation of burning or itching, followed by erythema and nodular eruption-fingers, wrists, and forearms. 3.3 <b>Treatment of Exposure:</b> Consult a physician. INHALATION: Remove from source. EYES: Wash with copious amounts of water and get medical attention. SKIN: Wash with soap and water. INGESTION: Give 2 to 3 glasses of water and induce vomiting. Consult physician. 3.4 <b>TLV-TWA:</b> Notice of intended change: 1.5 mg Ni/m <sup>3</sup> 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg (rat). 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Carcinogen of nasal cavity, paranasal sinuses, and lungs. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 10 mg Ni/m <sup>3</sup> 3.14 <b>OSHA PEL-TWA:</b> 1 mg/m <sup>3</sup> as nickel 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Ignites in air at about 400°C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Currently not available
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** None known
- 4.6 **Behavior in Fire:** Converts to black nickelic oxide ( $\text{Ni}_2\text{O}_3$ ).
- 4.7 **Auto Ignition Temperature:** Ignites in air at 400°C (752°F).
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 2.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 2.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Will not occur.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
96-hour TL<sub>50</sub> (Ni in soft water) varied from 4.6 to 9.8 mg/l for four species of warm water fishes.  
96-hour TL<sub>50</sub> (Ni in hard water), 27 and 32 mg/l for fathead minnow.  
48-hour LC<sub>50</sub> for Daphnia magna was 0.51 mg Ni/l.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 92.72
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** 446°F = 230°C = 503.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 4.1 at room temperature
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 3.2 (calculated)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# NICKEL HYDROXIDE

NKH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT PERTINENT		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T Y  S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# NICKEL SULFATE

NKS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nickelous sulfate	Solid crystals Pale green Odorless  Sinks and mixes slowly with water.
Avoid inhalation. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: NiSO<sub>4</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 9141
- 2.5 CAS Registry No.: 7786-81-4
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52349

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles; gloves.
- 3.2 Symptoms Following Exposure: Dermatitis.
- 3.3 Treatment of Exposure: Wash all affected parts with plenty of water.
- 3.4 TLV-TWA: Notice of intended change: 1.5 mg Ni/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Nose and lung cancer.
- 3.10 Vapor (Gas) Irritant Characteristics: None
- 3.11 Liquid or Solid Characteristics: Repeated contact can cause dermatitis.
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: 10 mg Ni/m<sup>3</sup>
- 3.14 OSHA PEL-TWA: 1 mg/m<sup>3</sup> as nickel
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not flammable
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not flammable
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 160 ppm/48 hr/rainbow trout/TL<sub>50</sub>/fresh water  
13.9 ppm/48 hr/prawn/LC<sub>50</sub>/salt water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical; reagent
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.
- 8.2 49 CFR Class: Not pertinent.
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 100 pounds
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 154.78
- 9.3 Boiling Point at 1 atm: Decomposes
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 3.68 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# NICKEL SULFATE

NKS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	28.190		N		N		N
36	28.790		O		O		O
38	29.390		T		T		T
40	29.990						
42	30.590		P		P		P
44	31.190		E		E		E
46	31.790		R		R		R
48	32.390		T		T		T
50	32.990		I		I		I
52	33.590		N		N		N
54	34.190		E		E		E
56	34.790		N		N		N
58	35.390		E		E		E
60	35.990		N		N		N
62	36.590		T		T		T
64	37.190						
66	37.790						
68	38.390						
70	38.990						
72	39.590						
74	40.190						
76	40.790						
78	41.390						
80	41.990						
82	42.590						
84	43.190						

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arthodibrom Bromex Dibrom 1,2-Dibromo-2,2-dichloroethyl dimethyl phosphate	Solid or liquid  White (solid) Light straw (liquid)  Slightly pungent
Sinks and mixes slowly with water.	
Evacuate. Keep people away. Avoid contact with liquid. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. SPRAY OR DUST POISONOUS IF INHALED. Irritating to skin and eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>4</sub>H<sub>2</sub>Br<sub>2</sub>Cl<sub>2</sub>O<sub>4</sub>P  
2.3 IMO/UN Designation: 6.1/2783 (>2.5%);  
9/2783 (<25%)  
2.4 DOT ID No.: 2783  
2.5 CAS Registry No.: 300-76-5  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification:  
51631

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, self-contained breathing apparatus, protective clothing.
- 3.2 **Symptoms Following Exposure:** INHALATION OR INGESTION: Symptoms secondary to cholinesterase inhibition are: headache, giddiness, nervousness, blurred vision, weakness, nausea, cramps, diarrhea, chest discomfort, sweating, miosis, tearing, salivation, and other excessive respiratory tract secretion, vomiting, cyanosis, muscle twitching, and convulsions. EYES: Irritating. SKIN: Irritating-can cause dermatitis.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Artificial respiration when needed. EYES: Irrigate with physiological saline or water. SKIN: Remove clothing and bathe thoroughly using lots of water and soap. When skin appears clear, bathe or swab with ethyl alcohol. INGESTION: Induce vomiting, give milk or water, and induce vomiting again. OTHER: Atropinize the patient immediately with 1 to 4 mg IM. To maintain atropinization, 2-mg doses at intervals of 15 to 60 minutes.
- 3.4 TLV-TWA: 3 mg/m<sup>3</sup>.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Cholinesterase inhibition persists for several weeks making person more vulnerable in case of additional exposure. Exposure of rats at 0.3 to 2.5 mg/l 4 hours daily for 6 months caused emphysema, interstitial pneumonia, bronchitis, and peribronchitis. Liver, spleen, and brain damage was noted.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Dangerous concentrations of vapor are not produced under normal conditions.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: 200 mg/m<sup>3</sup>
- 3.14 OSHA PEL-TWA: 3 mg/m<sup>3</sup>
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Currently not available
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Unstable in presence of Iron
- 5.3 **Stability During Transport:** Stable under anhydrous conditions. Unstable in alkaline conditions. Degraded by sunlight.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
24-hour LC<sub>50</sub> (Bluegills) = 0.22 mg/l  
48-hour LC<sub>50</sub> (Brook trout) = 0.078 mg/l  
96-hour LC<sub>50</sub> (Bluegills) = 0.18 mg/l  
24-hour LC<sub>50</sub> (Rainbow trout) = 1.3 mg/l at 1.6°C, 0.62 mg/l at 7.2°C, and 0.24 mg/l at 12.7°C
- 6.2 **Waterfowl Toxicity:** Oral LD<sub>50</sub> (Mallards) = 52.2 mg/kg Oral LD<sub>50</sub> (Canada geese) = 36.9 mg/kg
- 6.3 **Biological Oxygen Demand (BOD):**  
Hydrolyzes; Degrades rapidly in soil and water.
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: 4  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 93%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: Yes
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 10 pounds
- 8.7 EPA Pollution Category: A
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 381
- 9.3 Boiling Point at 1 atm: -392°F = -200°C = -473.2°K
- 9.4 Freezing Point: Pure 80.6°F = 27°C = 300.2°K
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 1.97 at 20°C
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: 13.1 (calculated)
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Currently not available
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

NOTES

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# NITROMETHANE

NMT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nitrocarbol	Watery liquid      Colorless      Strong odor  Sinks and mixes slowly with water. Irritating vapor is produced.
Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources and call fire department. Avoid contact with vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Evacuate surrounding area in large fire. Combat fires from behind barrier. Extinguish with water, foam, dry chemicals, or carbon dioxide. Cool exposed containers with water. Continue cooling after fire has been extinguished.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> No appreciable harm to skin or eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: CH<sub>3</sub>NO<sub>2</sub>
- 2.3 IMO/UN Designation: 3.3/1261
- 2.4 DOT ID No.: 1261
- 2.5 CAS Registry No.: 75-52-5
- 2.6 NAERG Guide No.: 129
- 2.7 Standard Industrial Trade Classification: 51140

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air mask (do NOT use organic canister); goggles.
- 3.2 **Symptoms Following Exposure:** Liquid may dry out skin and cause irritation.
- 3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min. SKIN: flush with water.
- 3.4 **TLV-TWA:** 20 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.
- 3.12 **Odor Threshold:** Less than 200 ppm
- 3.13 **IDLH Value:** 750 ppm
- 3.14 **OSHA PEL-TWA:** 100 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 110°F O.C. 95°F C.C.
- 4.2 **Flammable Limits in Air:** 7.3% (LEL)
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode
- 4.7 **Auto Ignition Temperature:** 785°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 1.1 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 8.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 3.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Wet material corrodes steel and copper, but the reaction is slow.
- 5.3 **Stability During Transport:** Considered stable, but may become sensitized by organic bases (amines) and some metal oxides, such as lead pigments.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: (1)
  - Human Oral hazard: 1
  - Human Contact hazard: I
  - Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95-99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open or pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	4
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 61.04
- 9.3 **Boiling Point at 1 atm:** 214.2°F = 101.2°C = 374.4°K
- 9.4 **Freezing Point:** -20°F = -29°C = 244°K
- 9.5 **Critical Temperature:** 599.0°F = 315°C = 588.2°K
- 9.6 **Critical Pressure:** 915.8 psia = 62.3 atm = 6.311 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.139 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 37.0 dynes/cm = 0.0370 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.172
- 9.12 **Latent Heat of Vaporization:** 241 Btu/lb = 134 cal/g = 5.61 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -4531 Btu/lb = -2517 cal/g = -105.4 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# NITROMETHANE

NMT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	72.589	-10	0.406	75	1.414		N O T
40	72.360	0	0.408	80	1.410		
45	72.139	10	0.410	85	1.407		
50	71.910	20	0.412	90	1.403		
55	71.690	30	0.415	95	1.400		
60	71.459	40	0.417	100	1.397		P E R T I N E N T
65	71.230	50	0.419	105	1.393		
70	71.009	60	0.421	110	1.390		
75	70.780	70	0.423	115	1.387		
80	70.559	80	0.426	120	1.383		
85	70.330	90	0.428	125	1.380		
90	70.110	100	0.430	130	1.376		
95	69.879	110	0.432	135	1.373		
100	69.660	120	0.435	140	1.370		
105	69.429	130	0.437	145	1.366		
110	69.209	140	0.439	150	1.363		
115	68.980			155	1.359		
120	68.759			160	1.356		
125	68.530			165	1.353		
130	68.299			170	1.349		
135	68.080						
140	67.849						
145	67.629						
150	67.400						
155	67.179						
160	66.950						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	10.000	60	0.381	60	0.00417	0	0.202
		70	0.524	70	0.00563	25	0.209
		80	0.711	80	0.00749	50	0.217
		90	0.951	90	0.00984	75	0.224
		100	1.255	100	0.01275	100	0.231
		110	1.636	110	0.01633	125	0.238
		120	2.109	120	0.02069	150	0.245
		130	2.689	130	0.02594	175	0.252
		140	3.395	140	0.03220	200	0.259
		150	4.246	150	0.03960	225	0.266
		160	5.264	160	0.04830	250	0.272
		170	6.470	170	0.05843	275	0.279
		180	7.891	180	0.07015	300	0.286
		190	9.553	190	0.08361	325	0.292
		200	11.480	200	0.09899	350	0.298
		210	13.710	210	0.11640	375	0.305
						400	0.311
						425	0.317
						450	0.323
						475	0.329
						500	0.334
						525	0.340
						550	0.346
						575	0.351
						600	0.357



# 1-NONENE

NNE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Heptylethylene 1-Nonylene	Liquid  Colorless  Gasoline-like odor  Floats on water. Flammable, irritating vapor is produced.
Keep people away. Avoid inhalation. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $C_7H_{14}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respiratory organic vapor canister or air-supplied mask; face splash shield.
- 3.2 **Symptoms Following Exposure:** High vapor concentrations irritate eyes and respiratory tract and act as an anesthetic.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; if breathing stops, apply artificial respiration; administer oxygen; call a physician. INGESTION: if swallowed, do NOT induce vomiting because of aspiration hazard.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present at high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 78°F O.C.
- 4.2 **Flammable Limits in Air:** 0.8% (LEL)
- 4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 6.0 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 64.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: (1)  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 126.2
- 9.3 **Boiling Point at 1 atm:** 297°F = 147°C = 420°K
- 9.4 **Freezing Point:** -115°F = -81.7°C = 191.5°K
- 9.5 **Critical Temperature:** 622.0°F = 327.8°C = 601°K
- 9.6 **Critical Pressure:** 360 psia = 24.5 atm = 2.98 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.733 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 23.0 dynes/cm = 0.0230 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.044
- 9.12 **Latent Heat of Vaporization:** 124 Btu/lb = 68.8 cal/g = 2.88 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -18,979 Btu/lb = -10,544 cal/g = -441.46 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.21 psia

### NOTES

# 1-NONENE

NNE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	46.290	34	0.491		C	40	0.756
50	46.010	36	0.492		U	50	0.701
60	45.740	38	0.493		R	60	0.652
70	45.460	40	0.494		R	70	0.608
80	45.190	42	0.495		E	80	0.569
90	44.920	44	0.497		N	90	0.533
100	44.640	46	0.498		T	100	0.501
110	44.370	48	0.499		L	110	0.472
120	44.090	50	0.500		Y	120	0.445
130	43.820	52	0.501			130	0.421
140	43.550	54	0.502		N	140	0.398
150	43.270	56	0.503		O	150	0.378
160	43.000	58	0.504		T	160	0.359
170	42.720	60	0.505			170	0.342
180	42.450	62	0.507		A	180	0.326
190	42.180	64	0.508		V	190	0.311
200	41.900	66	0.509		A	200	0.298
210	41.630	68	0.510		I	210	0.285
		70	0.511		L		
		72	0.512		A		
		74	0.513		B		
		76	0.514		L		
		78	0.515		E		
		80	0.517				
		82	0.518				
		84	0.519				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.081	70	0.00179	0	0.335
	N	75	0.096	75	0.00211	25	0.350
	S	80	0.114	80	0.00249	50	0.364
	O	85	0.135	85	0.00291	75	0.379
	L	90	0.159	90	0.00340	100	0.393
	U	95	0.187	95	0.00396	125	0.407
	B	100	0.219	100	0.00459	150	0.421
	I	105	0.255	105	0.00531	175	0.435
	E	110	0.296	110	0.00611	200	0.448
		115	0.343	115	0.00702	225	0.462
		120	0.396	120	0.00803	250	0.475
		125	0.455	125	0.00916	275	0.488
		130	0.523	130	0.01042	300	0.501
		135	0.598	135	0.01182	325	0.514
		140	0.682	140	0.01337	350	0.526
		145	0.776	145	0.01508	375	0.538
		150	0.880	150	0.01697	400	0.551
		155	0.996	155	0.01905	425	0.562
		160	1.124	160	0.02133	450	0.574
		165	1.266	165	0.02383	475	0.586
		170	1.423	170	0.02656	500	0.597
		175	1.595	175	0.02954	525	0.609
		180	1.784	180	0.03278	550	0.620
		185	1.991	185	0.03630	575	0.631
		190	2.217	190	0.04012	600	0.641
		195	2.465	195	0.04426		

# NONANOL

NNN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Nonanol Nonyl alcohol Nonyl alcohol/pelargonic alcohol Octylcarbinol		Liquid	Colorless	Rose or fruity odor
		Floats on water. Freezing point is 23°F.		
Call fire department. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_8\text{CH}_2\text{OH}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 143-08-8  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51219

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves.  
3.2 Symptoms Following Exposure: Liquid irritates eyes.  
3.3 Treatment of Exposure: Flush eyes and skin with water for at least 15 min.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5$  to  $5 \text{ g/kg}$  (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat.  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 210°F O.C.  
: 165°F C.C.  
4.2 Flammable Limits in Air: 0.8%-6.1%  
4.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 69.0 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 19.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): (theor.) 9.9%, 1 day  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: -  
Human Contact hazard: I  
Reduction of amenities: XX
- 7.1 Grades of Purity: 97%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: C  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available
8. HAZARD CLASSIFICATIONS
- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed
9. PHYSICAL & CHEMICAL PROPERTIES
- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 144.26  
9.3 Boiling Point at 1 atm: 415°F = 213°C = 486°K  
9.4 Freezing Point: 23°F = -5°C = 268°K  
9.5 Critical Temperature: 759.2°F = 404°C = 677.2°K  
9.6 Critical Pressure: 350 psia = 24 atm = 2.4 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.827 at 20°C (liquid)  
9.8 Liquid Surface Tension: 28 dynes/cm = 0.028 N/m at 24°C  
9.9 Liquid Water Interfacial Tension: 9.0 dynes/cm = 0.0090 N/m at 21.3°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.039  
9.12 Latent Heat of Vaporization: 131 Btu/lb = 72.5 cal/g =  $3.04 \times 10^5 \text{ J/kg}$   
9.13 Heat of Combustion: -17,800 Btu/lb = -9860 cal/g =  $-413 \times 10^5 \text{ J/kg}$   
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# NONANOL

NNN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	52.480	85	0.588	60	1.055	46	20.900
40	52.340	90	0.595	65	1.052	48	19.940
45	52.200	95	0.603	70	1.048	50	19.030
50	52.060	100	0.610	75	1.045	52	18.160
55	51.920	105	0.617	80	1.042	54	17.350
60	51.780	110	0.624	85	1.039	56	16.570
65	51.640	115	0.632	90	1.036	58	15.840
70	51.510	120	0.639	95	1.033	60	15.140
75	51.370	125	0.646	100	1.030	62	14.480
80	51.230	130	0.653	105	1.027	64	13.860
85	51.090	135	0.660	110	1.023	66	13.260
90	50.950	140	0.668	115	1.020	68	12.690
95	50.810	145	0.675	120	1.017	70	12.160
100	50.670	150	0.682	125	1.014	72	11.650
105	50.530			130	1.011	74	11.160
110	50.400			135	1.008	76	10.700
115	50.260			140	1.005	78	10.260
120	50.120			145	1.001	80	9.839
				150	0.998	82	9.440
				155	0.995	84	9.061
				160	0.992	86	8.699
				165	0.989	88	8.354
				170	0.986	90	8.025
				175	0.983	92	7.711
				180	0.979	94	7.412
				185	0.976	96	7.126

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	220	0.244	220	0.00482	0	0.329
	N	230	0.327	230	0.00638	25	0.343
	S	240	0.435	240	0.00835	50	0.357
	O	250	0.570	250	0.01079	75	0.371
	L	260	0.738	260	0.01379	100	0.384
	U	270	0.947	270	0.01744	125	0.398
	B	280	1.202	280	0.02184	150	0.411
	L	290	1.511	290	0.02709	175	0.424
	E	300	1.884	300	0.03333	200	0.437
		310	2.329	310	0.04066	225	0.450
		320	2.856	320	0.04923	250	0.463
		330	3.476	330	0.05916	275	0.475
		340	4.202	340	0.07061	300	0.488
		350	5.044	350	0.08373	325	0.500
		360	6.018	360	0.09867	350	0.512
		370	7.137	370	0.11560	375	0.524
		380	8.415	380	0.13470	400	0.536
		390	9.868	390	0.15610	425	0.547
		400	11.510	400	0.18000	450	0.559
		410	13.360	410	0.20650	475	0.570
		420	15.440	420	0.23590	500	0.582
		430	17.760	430	0.26830	525	0.593
		440	20.350	440	0.30400	550	0.604
		450	23.210	450	0.34290	575	0.615
		460	26.380	460	0.38550	600	0.625
		470	29.860	470	0.43170		

# NONYLPHENOL

NNP

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Thick liquid	Light yellow, straw color	Medicinal odor
	Floats on water.		
<b>Keep people away. Avoid contact with liquid.</b> <b>Wear rubber overclothing (including gloves).</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
Fire	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
Exposure	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 21; Phenol, cresol  
2.2 Formula: p-HOC<sub>6</sub>H<sub>4</sub>(CH<sub>2</sub>)<sub>9</sub>CH<sub>3</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 25154-52-3  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51244

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Rubber gloves and splash-proof goggles.  
3.2 Symptoms Following Exposure: Moderately toxic if swallowed. Severely irritating to skin and eyes.  
3.3 Treatment of Exposure: EYES: wash with water for 15 min. and get medical attention. SKIN: wash with soap and water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 300°F O.C. 285°F C.C.  
4.2 Flammable Limits in Air: Approx. 1% (calc. LEL)  
4.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 97.6 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 27.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 2  
Damage to living resources: 4  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 90% para-isomer, plus 4% ortho-isomer and 5% 2, 4- dinonylphenol  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: A  
7.6 Ship Type: 2  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  
Category Classification  
Health Hazard (Blue)..... 2  
Flammability (Red)..... 1  
Instability (Yellow)..... 0  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 220.36  
9.3 Boiling Point at 1 atm: 579°F = 304°C = 577°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: 878.0°F = 470°C = 743.2°K  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.9494 at 25°C (liquid)  
9.8 Liquid Surface Tension: (est.) 30 dynes/cm = 0.03 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 30 dynes/cm = 0.03 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -17,500 Btu/lb = -9730 cal/g = -407 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Low

### NOTES

# NONYLPHENOL

NNP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
65	59.360	85	0.486	50	1.040	80	1513.000
70	59.240	90	0.497	52	1.040	85	1274.000
75	59.130	95	0.508	54	1.040	90	1076.000
80	59.020	100	0.519	56	1.040	95	912.000
85	58.900	105	0.529	58	1.040	100	775.099
90	58.790	110	0.540	60	1.040	105	660.599
95	58.670	115	0.551	62	1.040	110	564.699
100	58.560	120	0.562	64	1.040	115	484.000
105	58.440	125	0.573	66	1.040	120	415.899
110	58.330	130	0.583	68	1.040	125	358.299
115	58.210	135	0.594	70	1.040	130	309.500
120	58.090	140	0.605	72	1.040	135	268.000
125	57.970	145	0.616	74	1.040	140	232.599
130	57.850	150	0.626	76	1.040	145	202.400
				78	1.040	150	176.500
				80	1.040	155	154.199
				82	1.040	160	135.099
				84	1.040	165	118.599
						170	104.299
						175	91.910

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	340	0.255	340	0.00654		N
	N	360	0.404	360	0.01013		O
	S	380	0.623	380	0.01524		T
	O	400	0.935	400	0.02233		P
	L	420	1.370	420	0.03197		E
	U	440	1.962	440	0.04477		R
	B	460	2.755	460	0.06148		T
	L	480	3.795	480	0.08291		I
	E	500	5.141	500	0.11000		N
		520	6.854	520	0.14360		E
		540	9.005	540	0.18490		N
		560	11.670	560	0.23500		N
		580	14.940	580	0.29510		T
		600	18.910	600	0.36630		
		620	23.670	620	0.45000		
		640	29.330	640	0.54750		
		660	36.000	660	0.66010		

# NICKEL NITRATE

NNT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nickel nitrate hexahydrate	Solid  Green  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2725  
2.5 CAS Registry No.: 14216-75-2  
2.6 NAERG Guide No.: 140  
2.7 Standard Industrial Trade Classification: 52359

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Bu. Mines approved respirator; rubber gloves; face shield or safety goggles; protective clothing  
3.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting. Dust irritates eyes and may cause dermatitis in contact with skin.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air; get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with water for at least 15 min. SKIN: wash with soap and water.  
3.4 **TLV-TWA:** Notice of intended change: 1.5 mg  $\text{Ni}/\text{m}^3$   
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50}$  = 0.5-5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Possible lung cancer  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 10 mg  $\text{Ni}/\text{m}^3$   
3.14 **OSHA PEL-TWA:** 1 mg/ $\text{m}^3$  as nickel  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable, but may intensify fire  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.  
4.6 **Behavior in Fire:** May increase intensity of fire if in contact with combustible material  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Contact of solid with wood or paper may cause fires.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
2.44 ppm"/stickleback/threshold conc./tap water  
0.8 ppm/10 days/stickleback/TL<sub>w</sub>/fresh water  
\*Time period not specified.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Purified, 99.1%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** None  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer  
8.2 **49 CFR Class:** 5.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0 1            |
| Flammability (Red).....   | 0 0            |
| Instability (Yellow)..... | 0 0            |
| Special (White).....      | OX OX          |

\* First column refers to nonfire situation.

- 8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 290.8  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 2.05 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** 47 Btu/lb = 26 cal/g = 1.1 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# NICKEL NITRATE

NNT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	80.030		N		N		N
36	80.870		O		O		O
38	81.700		T		T		T
40	82.530						
42	83.370		P		P		P
44	84.200		E		E		E
46	85.030		R		R		R
48	85.870		T		T		T
50	86.700		I		I		I
52	87.530		N		N		N
54	88.370		E		E		E
56	89.200		N		N		N
58	90.030		E		E		E
60	90.870		N		N		N
62	91.700		T		T		T
64	92.530						
66	93.370						
68	94.200						
70	95.030						
72	95.870						
74	96.700						
76	97.530						
78	98.370						
80	99.200						
82	100.000						
84	100.900						



# NONENE

NON

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nonene (nonlinear) Propylene trimer Tripropylene	Liquid                      Colorless                      Gasoline-like odor  Floats on water. Flammable, irritating vapor is produced.
<p>Keep people away.  Avoid inhalation.  Shut off ignition sources and call fire department.  Stay upwind and use water spray to "knock down" vapor.  Avoid contact with liquid and vapor.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	<b>FLAMMABLE:</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause dizziness or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula: C<sub>9</sub>H<sub>18</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2057  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respiratory organic vapor canister or air-supplied mask; face splash shield.  
3.2 **Symptoms Following Exposure:** High vapor concentrations irritate eyes and respiratory tract and act as an anesthetic.  
3.3 **Treatment of Exposure:** INHALATION: remove patient to fresh air; if breathing stops, apply artificial respiration and administer oxygen; call a physician. INGESTION: do NOT induce vomiting because of aspiration hazard.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present at high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 78°F O.C.  
4.2 **Flammable Limits in Air:** 0.7%-3.9% (est.)  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 6.0 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 64.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	3
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 126.2  
9.3 **Boiling Point at 1 atm:** 275–284°F = 135–140°C = 408–413°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.739 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 22 dynes/cm = 0.022 N/m at 24°C  
9.9 **Liquid Water Interfacial Tension:** 35.5 dynes/cm = 0.0355 N/m at 21.3°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.044  
9.12 **Latent Heat of Vaporization:** (est.) 124 Btu/lb = 68.9 cal/g = 2.88 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** –19,100 Btu/lb = –10,600 cal/g = –445 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.21 psia

### NOTES

# NONENE

NON

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
32	47.120	85	0.529	42	1.040	46	0.722
34	47.060	90	0.533	44	1.040	48	0.712
36	47.010	95	0.536	46	1.040	50	0.701
38	46.950	100	0.540	48	1.040	52	0.691
40	46.900	105	0.543	50	1.040	54	0.681
42	46.840	110	0.547	52	1.040	56	0.671
44	46.790	115	0.550	54	1.040	58	0.662
46	46.730	120	0.554	56	1.040	60	0.653
48	46.680	125	0.557	58	1.040	62	0.643
50	46.620	130	0.561	60	1.040	64	0.635
52	46.570	135	0.564	62	1.040	66	0.626
54	46.510	140	0.568	64	1.040	68	0.617
56	46.460	145	0.571	66	1.040	70	0.609
58	46.400	150	0.575	68	1.040	72	0.601
60	46.350			70	1.040	74	0.593
62	46.300			72	1.040	76	0.585
64	46.240			74	1.040	78	0.577
66	46.190			76	1.040	80	0.570
68	46.130			78	1.040	82	0.562
70	46.080			80	1.040	84	0.555
72	46.020			82	1.040	86	0.548
74	45.970			84	1.040	88	0.541
76	45.910					90	0.534
78	45.860					92	0.528
80	45.800					94	0.521
82	45.750					96	0.515

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	80	0.114	80	0.00248	0	0.335
	N	90	0.159	90	0.00340	25	0.350
	S	100	0.218	100	0.00459	50	0.364
	O	110	0.296	110	0.00610	75	0.379
	L	120	0.395	120	0.00802	100	0.393
	U	130	0.522	130	0.01040	125	0.407
	B	140	0.681	140	0.01335	150	0.421
	L	150	0.879	150	0.01695	175	0.435
	E	160	1.123	160	0.02130	200	0.448
		170	1.421	170	0.02652	225	0.462
		180	1.781	180	0.03274	250	0.475
		190	2.214	190	0.04007	275	0.488
		200	2.730	200	0.04866	300	0.501
		210	3.341	210	0.05866	325	0.514
		220	4.059	220	0.07022	350	0.526
		230	4.898	230	0.08349	375	0.538
		240	5.872	240	0.09866	400	0.551
		250	6.996	250	0.11590	425	0.563
		260	8.286	260	0.13540	450	0.574
		270	9.760	270	0.15730	475	0.586
		280	11.440	280	0.18180	500	0.597
		290	13.330	290	0.20910	525	0.609
		300	15.470	300	0.23930	550	0.620
		310	17.860	310	0.27280	575	0.631
		320	20.540	320	0.30970	600	0.642
		330	23.510	330	0.35010		

# NITROGEN TETROXIDE

NOX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dinitrogen tetroxide Nitrogen dioxide Nitrogen peroxide Oxides of nitrogen Red oxide of nitrogen	Liquefied compressed gas Red-brown Sharp, unpleasant chemical odor  Sinks and reacts with water. Poisonous brown vapor is produced.
<b>Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</b> <b>Evacuate area in case of large discharge.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable. May cause fire and explode on contact with combustibles. <b>POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Flood discharge area with water. Stop flow of gas or liquid. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  VAPOR POISONOUS IF INHALED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. POISONOUS IF SWALLOWED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** N<sub>2</sub>O<sub>4</sub>  
2.3 **IMO/UN Designation:** 2/1067  
2.4 **DOT ID No.:** 1067  
2.5 **CAS Registry No.:** 10102-44-0  
2.6 **NAERG Guide No.:** 124  
2.7 **Standard Industrial Trade Classification:** 52239

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; safety goggles and face shield; protective clothing; acid gas canister respirator or self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** Very concentrated fumes produce coughing, choking, headache, nausea, pain in chest and abdomen; otherwise, few symptoms appear at time of exposure. After symptom-free period of 5-72 hours, pulmonary edema gradually develops, causing fatigue, restlessness, coughing, difficulty in breathing, frothy expectoration, mental confusion, lethargy, bluish skin, and weak, rapid pulse. Since NOX interferes with gas exchange in lungs, unconsciousness and death by asphyxiation can result, usually within a few hours after onset of pulmonary edema.
- 3.3 **Treatment of Exposure:** INHALATION: remove patient to fresh air and have him breathe as deeply as possible; call a doctor; enforce complete rest for 24-48 hours; keep warm; give oxygen if coughing starts; physician may administer morphine (10 mg.) EYES AND SKIN: flush with water for at least 15 min.
- 3.4 **TLV-TWA:** 3 ppm  
3.5 **TLV-STEL:** 5 ppm  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** 5 ppm  
3.13 **IDLH Value:** 20 ppm  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 5 ppm.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Stop flow of gas
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Produces toxic gas when heated.
- 4.6 **Behavior in Fire:** Does not burn, but supports combustion of combustible materials such as wood. May cause fire or explode on contact with other materials.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves to form nitric acid and nitric oxide. Nitric oxide reacts with air to form more nitrogen tetroxide.
- 5.2 **Reactivity with Common Materials:** Very corrosive to metals when wet. Reacts vigorously with combustible materials such as wood.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, then use soda ash or lime.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
72 ppm/96 hr/mosquito fish/TL<sub>50</sub>/fresh water  
330-1000 ppm/48 hr/cockle/LC<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Ambient. Storage and transfer structures shall be equipped with mechanical ventilation systems.
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure relief valves on containers
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison gas
- 8.2 **49 CFR Class:** 2.3
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
| Special (White).....      | OX             |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Soluble
- 9.2 **Molecular Weight:** 92.02
- 9.3 **Boiling Point at 1 atm:** 70.1°F = 21.2°C = 294°K
- 9.4 **Freezing Point:** 11.8°F = -11.2°C = 262°K
- 9.5 **Critical Temperature:** 316.8°F = 158.2°C = 431.4°K
- 9.6 **Critical Pressure:** 1470 psia = 100 atm = 10.1 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.45 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 3.2
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.262
- 9.12 **Latent Heat of Vaporization:** 178 Btu/lb = 99.1 cal/g = 4.15 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 60.2 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 30 psia

### NOTES

# NITROGEN TETROXIDE

NOX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	93.370	28	0.358		N	69	0.413
40	92.940	30	0.358		O		
45	92.509	32	0.359		T		
50	92.070	34	0.359				
55	91.639	36	0.360		P		
60	91.209	38	0.360		E		
65	90.770	40	0.361		R		
70	90.339	42	0.361		T		
		44	0.361		I		
		46	0.362		N		
		48	0.362		E		
		50	0.363		N		
		52	0.363		T		
		54	0.364				
		56	0.364				
		58	0.365				
		60	0.365				
		62	0.366				
		64	0.366				
		66	0.366				
		68	0.367				
		70	0.367				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	-30	0.605	-30	0.00907	90	0.138
	E	-20	0.888	-20	0.01300	100	0.138
	A	-10	1.281	-10	0.01833	110	0.138
	C	0	1.818	0	0.02545	120	0.138
	T	10	2.543	10	0.03485	130	0.138
	S	20	3.509	20	0.04708	140	0.138
		30	4.780	30	0.06282	150	0.138
		40	6.431	40	0.08283	160	0.138
		50	8.554	50	0.10800	170	0.138
		60	11.260	60	0.13940	180	0.138
		70	14.660	70	0.17810	190	0.138
		80	18.910	80	0.22550	200	0.138
		90	24.160	90	0.28290	210	0.138
		100	30.620	100	0.35200	220	0.138
		110	38.480	110	0.43460	230	0.138
		120	47.980	120	0.53260	240	0.138
		130	59.380	130	0.64800	250	0.138
		140	72.980	140	0.78320	260	0.138
		150	89.099	150	0.94050		
		160	108.099	160	1.12200		
		170	130.299	170	1.33200		
		180	156.199	180	1.57200		
		190	186.299	190	1.84500		
		200	220.900	200	2.15500		
		210	260.599	210	2.50400		

# 4-NITROPHENOL

NPH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 4-Hydroxynitrobenzene p-Nitrophenol PNP	Solid  Yellow to brown  Sweet odor  Sinks and mixes with water.
Keep people away. Avoid contact with solid, dust and vapor. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause headache or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause headache, nausea, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 1,4-HOC<sub>6</sub>H<sub>4</sub>NO<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/1663  
2.4 DOT ID No.: 1663  
2.5 CAS Registry No.: 100-02-7  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51243

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Butyl rubber gloves; side-shield safety glasses; dust mask or self-contained breathing apparatus.  
3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, drowsiness, nausea, and blue color in lips, ears, and fingernails (cyanosis). Contact with eyes or skin causes irritation; can be absorbed through skin to give same symptoms as for inhalation.  
3.3 **Treatment of Exposure:** INHALATION or INGESTION: remove victim to fresh air; give artificial respiration; call a doctor if symptoms persist. EYES: flush with water for at least 15 minutes; get medical attention. SKIN: flush with water and wash well with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50-500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
Not pertinent (combustible solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and fumes of unburned material may form in fires.  
4.6 **Behavior in Fire:** Decomposes violently at 279°C and will burn even in absence of air.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 32.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical; Pure  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U170  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 139.1  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** 235°F = 113°C = 386°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.48 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -8,870 Btu/lb = -4,930 cal/g = -206 x 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 41.70 cal/g  
9.18 **Limiting Value:** Data not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 4-NITROPHENOL

NPH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	1.600		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 1-NITROPROPANE

NPN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Propane, 1-nitro-	Liquid  Colorless  Mild, fruity odor  May float or sink in water, depending on temperature. Slowly mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear full protective clothing with self-contained breathing apparatus. (AVOID CARBON-TYPE RESPIRATOR WITH HOPCALITE CATALYST.) Shut off ignition sources. Call fire department. Evacuate area. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Vapor may explode if ignited in an enclosed area. Flashback along vapor trail may occur. Extinguish with water spray, fog or alcohol foam; also may use CO <sub>2</sub> for small fire. Dry chemicals may react in the presence of water to produce salts which may explode when dry. Cool exposed containers with water spray. Combat fires from a safe distance or protected location.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes and respiratory system. If inhaled, will cause headache, nausea, vomiting, and diarrhea. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of running water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, will cause headache, dizziness, nausea, vomiting, diarrhea, restlessness and muscular uncoordination. If swallowed and victim is CONSCIOUS, give large volumes of water and induce vomiting. If swallowed and the victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. If in EYES, hold eyelids open and flush with plenty of running water for at least 15 minutes. If on SKIN, wash with soap or mild detergent under running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Fouling to shoreline. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim; Pump  
Chemical and Physical Treatment:  
Absorb  
Do not burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

**2.1 CG Compatibility Group:** 42;  
Nitrocompounds  
**2.2 Formula:** C<sub>3</sub>H<sub>7</sub>NO<sub>2</sub>  
**2.3 IMO/UN Designation:** 3.3/2608  
**2.4 DOT ID No.:** 2608  
**2.5 CAS Registry No.:** 108-03-2  
**2.6 NAERG Guide No.:** 129  
**2.7 Standard Industrial Trade Classification:**  
51140

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Wear self-contained breathing apparatus and full protective clothing including helmet, coat and pants worn by fire fighters, rubber boots, gloves, bands around legs, arms and waist along with face mask and coverings for parts of neck and head not protected by other apparel. Carbon type respirators containing HOPCALITE, an oxide catalyst that converts carbon monoxide to carbon dioxide, should not be used with high vapor concentrations of 1-nitropropane because the resulting reaction may cause a fire.
- 3.2 Symptoms Following Exposure:** Inhalation causes headache, dizziness, nausea, vomiting, diarrhea, restlessness, muscular uncoordination and irritation of the respiratory tract. Contact causes irritation of the eyes and skin. Ingestion may cause headache, dizziness, nausea, vomiting, restlessness and muscular uncoordination.
- 3.3 Treatment of Exposure:** INHALATION: Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Immediately begin to flush eyes with running water; lift upper and lower eyelids occasionally. Continue to wash for at least 15 minutes. SKIN: Wash immediately with running water and soap or mild detergent. Continue for at least 15 minutes. Remove and isolate contaminated clothing and shoes. INGESTION: If the victim is CONSCIOUS, give large volumes of water and induce vomiting. If the victim is UNCONSCIOUS, keep the victim warm. Get immediate medical attention.
- 3.4 TLV-TWA:** 25 ppm  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 455mg/kg (rat)  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Causes liver, kidney and heart damage.  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapor causes moderate irritation such that personnel will find high concentrations unpleasant.  
**3.11 Liquid or Solid Characteristics:** If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
**3.12 Odor Threshold:** 300 ppm  
**3.13 IDLH Value:** 1,000 ppm  
**3.14 OSHA PEL-TWA:** 25 ppm.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 120°F O.C.  
96°F C.C  
**4.2 Flammable Limits in Air:** 2.2% (LFL)  
**4.3 Fire Extinguishing Agents:** Small fires: carbon dioxide, CO<sub>2</sub>, water spray or alcohol foam. Large Fires: Water spray, fog, or alcohol foam. Unmanned nozzles should be used for a massive fire in a cargo area. Fires should be fought from an explosion-resistant location.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Do not use dry chemicals because some of them may react with water to make the fire worse. In the presence of water, inorganic bases react with nitropropane to produce salts which are explosive when dry.  
**4.5 Special Hazards of Combustion**  
**Products:** Combustion products include toxic oxides of nitrogen along with carbon monoxide.  
**4.6 Behavior in Fire:** Produces toxic gases and vapors. Containers may explode in heat of fire. Vapor explosive hazard indoors, outdoors or in sewer. Runoff to sewer may create fire or explosion hazard. Flashback may occur along vapor trail.  
**4.7 Auto Ignition Temperature:** 789°F.  
**4.8 Electrical Hazards:** Class: 1; Group: C  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 22.6 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 7.5 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** Contact with amines, strong acids, metal oxides, and alkalis may cause 1-nitropropane to become unstable. May react with strong oxidizers to produce fires or explosions. Highly flammable when mixed with hydrocarbons or other combustibles. Attacks some forms of plastics, rubber, and coatings.  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Small spills may be covered with soda ash then mixed with water and subsequently neutralized with 6 molar hydrochloric acid.  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (I)  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 98%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Pressure vacuum valve  
**7.5 IMO Pollution Category:** D  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Keep Away From Food  
**8.2 49 CFR Class:** 6.1  
**8.3 49 CFR Package Group:** III  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	1

**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 89.1  
**9.3 Boiling Point at 1 atm:** 269°F = 131.6°C = 405°K  
**9.4 Freezing Point:** -162°F = -108°C = 165°K  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 0.9934 at 25°C (liquid)  
**9.8 Liquid Surface Tension:** 30.57 dynes/cm = 0.0306 N/m at 25°C  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** 3.1  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** 09.5 Btu/lb = 116.4 cal/g = 4.87 X 10<sup>6</sup> J/kg  
**9.13 Heat of Combustion:** 9,723 Btu/lb = 5,402 cal/g = 22.62 X 10<sup>6</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# 1-NITROPROPANE

NPN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	62.420		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	77	0.798

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.400		C U R R E N T L Y  N O T  A V A I L A B L E	68	0.00229		C U R R E N T L Y  N O T  A V A I L A B L E



# 2-NITROPROPANE

**NPP**

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isopropyl nitropropane sec-Nitropropane 2-NP	Liquid  Colorless  Mild, fruity odor  May float or sink in water.
Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, coughing, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea, and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim; Pump  
Chemical and Physical Treatment:  
Absorb  
Do not burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 42;  
Nitrocompound  
2.2 Formula:  $\text{CH}_3\text{CH}(\text{NO}_2)\text{CH}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2608  
2.5 CAS Registry No.: 79-46-9  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification:  
51140

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; goggles or face shield; rubber gloves
- 3.2 **Symptoms Following Exposure:** Inhalation causes respiratory tract irritation, headache, dizziness, nausea, and diarrhea. Ingestion causes irritation of mouth and stomach. Contact with liquid irritates eyes and causes mild irritation of skin.
- 3.3 **Treatment of Exposure:** INHALATION: in case of pulmonary symptoms, enforce bed rest and give oxygen; get medical attention at once. INGESTION: give large amount of water and induce vomiting. EYES or SKIN: flush with water.
- 3.4 **TLV-TWA:** 10 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral rat  $\text{LD}_{50}$  = 720 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes liver cancer in rats
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** 300 ppm
- 3.13 **IDLH Value:** 100 ppm
- 3.14 **OSHA PEL-TWA:** 25 ppm.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 100°F O.C. 82°F C.C.
- 4.2 **Flammable Limits in Air:** 2.6% (LFL)
- 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** "Alcohol" foam; water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** 802°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 22.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** May attack some forms of plastics
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 94+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 2              |
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** U171
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 89.09
- 9.3 **Boiling Point at 1 atm:** 248.5°F = 120.3°C = 393.5°K
- 9.4 **Freezing Point:** -132°F = -91°C = 182°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.99 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 30 dynes/cm = 0.030 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 3.06 at 16°C
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.090 at 20°C
- 9.12 **Latent Heat of Vaporization:** 178 Btu/lb = 99 cal/g =  $4.1 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** -9,650 Btu/lb = -5,360 cal/g =  $-224 \times 10^5$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2-NITROPROPANE

NPP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	62.100	N O T  P E R T I N E N T		80	0.889	52	0.865
61	62.060			90	0.877	54	0.852
62	62.030			100	0.864	56	0.839
63	61.990			110	0.852	58	0.827
64	61.950			120	0.840	60	0.815
65	61.910			130	0.828	62	0.803
66	61.870			140	0.815	64	0.791
67	61.840			150	0.803	66	0.780
68	61.800			160	0.791	68	0.769
69	61.760			170	0.779	70	0.758
70	61.720			180	0.766	72	0.747
71	61.680			190	0.754	74	0.737
72	61.640			200	0.742	76	0.727
73	61.610			210	0.730	78	0.717
74	61.570			220	0.717	80	0.707
75	61.530			230	0.705	82	0.697
76	61.490					84	0.688
77	61.450					86	0.679
78	61.420					88	0.670
79	61.380					90	0.661
80	61.340					92	0.653
81	61.300					94	0.644
82	61.260						
83	61.230						
84	61.190						
85	61.150						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	1.473	60	0.237	60	0.00378	0	0.239
36	1.487	70	0.317	70	0.00497	20	0.248
38	1.500	80	0.420	80	0.00646	40	0.257
40	1.513	90	0.551	90	0.00832	60	0.266
42	1.527	100	0.716	100	0.01062	80	0.274
44	1.540	110	0.921	110	0.01342	100	0.283
46	1.553	120	1.176	120	0.01683	120	0.291
48	1.567	130	1.488	130	0.02094	140	0.300
50	1.580	140	1.868	140	0.02586	160	0.308
52	1.593	150	2.328	150	0.03169	180	0.316
54	1.607	160	2.881	160	0.03859	200	0.324
56	1.620	170	3.541	170	0.04667	220	0.331
58	1.633	180	4.324	180	0.05610	240	0.339
60	1.647	190	5.248	190	0.06704	260	0.347
62	1.660	200	6.332	200	0.07966	280	0.354
64	1.673	210	7.597	210	0.09415	300	0.361
66	1.687	220	9.067	220	0.11070	320	0.368
68	1.700	230	10.760	230	0.12950	340	0.375
70	1.713	240	12.720	240	0.15090	360	0.382
72	1.727					380	0.389
74	1.740					400	0.395
76	1.753					420	0.402
78	1.767					440	0.408
80	1.780					460	0.415
82	1.793					480	0.421
84	1.807					500	0.427

# NAPHTHA: STODDARD SOLVENT

NSS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Drycleaner naphtha Petroleum solvent Spotting naphtha	Watery liquid  Colorless  Gasoline-like odor  Floats on water.
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** Not applicable  
2.3 **IMO/UN Designation:** 3.3/1268  
2.4 **DOT ID No.:** 1268  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 128  
2.7 **Standard Industrial Trade Classification:**  
33429

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield (as for gasoline).  
3.2 **Symptoms Following Exposure:** High concentration of vapors may cause intoxication. If liquid is swallowed, it may get into lungs by aspiration; not very irritating to skin or eyes.  
3.3 **Treatment of Exposure:** INHALATION: remove patient from exposure; treat symptoms. INGESTION: do NOT induce vomiting! Call a doctor. EYES: flush with water for 15 min. SKIN: wipe off and wash with soap and water.  
3.4 **TLV-TWA:** 100 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 20,000 mg/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 500 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 110°F C.C.  
4.2 **Flammable Limits in Air:** 0.8%-5.0%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 540°F (est.)  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 320–390°F = 160–199°C = 433–472°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.78 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 19–23 dynes/cm = 0.019–0.023 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 39–51 dynes/cm = 0.039–0.051 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
(est.) 1.030  
9.12 **Latent Heat of Vaporization:** 130–150 Btu/lb = 71–81 cal/g = 3.0–3.4 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) –18,200 Btu/lb = –10,100 cal/g = –424 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.1 psia

### NOTES

# NAPHTHA: STODDARD SOLVENT

NSS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	48.690	50	0.478	50	1.040	50	9.343
52	48.690	52	0.478	52	1.040	52	8.841
54	48.690	54	0.478	54	1.040	54	8.370
56	48.690	56	0.478	56	1.040	56	7.927
58	48.690	58	0.478	58	1.040	58	7.511
60	48.690	60	0.478	60	1.040	60	7.119
62	48.690	62	0.478	62	1.040	62	6.751
64	48.690	64	0.478	64	1.040	64	6.404
66	48.690	66	0.478	66	1.040	66	6.078
68	48.690	68	0.478	68	1.040	68	5.770
70	48.690	70	0.478	70	1.040	70	5.481
72	48.690	72	0.478	72	1.040	72	5.207
74	48.690	74	0.478	74	1.040	74	4.950
76	48.690	76	0.478	76	1.040	76	4.707
78	48.690	78	0.478	78	1.040	78	4.477
80	48.690	80	0.478	80	1.040	80	4.260
82	48.690	82	0.478	82	1.040	82	4.056
84	48.690	84	0.478	84	1.040	84	3.862
86	48.690	86	0.478	86	1.040	86	3.679
88	48.690	88	0.478	88	1.040	88	3.506
90	48.690	90	0.478	90	1.040	90	3.342
92	48.690	92	0.478	92	1.040	92	3.187
94	48.690	94	0.478	94	1.040	94	3.040
96	48.690	96	0.478	96	1.040	96	2.901
98	48.690	98	0.478	98	1.040	98	2.770
100	48.690	100	0.478	100	1.040	100	2.645

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	90	0.094		N		C
	N	100	0.124		O		U
	S	110	0.163		T		R
	O	120	0.211				R
	L	130	0.272		P		E
	U	140	0.347		E		N
	B	150	0.440		R		T
	L	160	0.553		T		L
	E	170	0.691		I		Y
		180	0.856		N		
		190	1.054		E		N
		200	1.290		N		O
		210	1.569		T		T
		220	1.897				
		230	2.281				A
		240	2.728				V
		250	3.247				A
		260	3.846				I
		270	4.535				L
		280	5.323				A
		290	6.221				B
		300	7.241				L
		310	8.394				E
		320	9.695				
		330	11.160				
		340	12.790				

# NAPHTHA: SOLVENT

NSV

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Light naphtha Petroleum solvent	Watery liquid Colorless Gasoline-like odor  Floats on water. Vapor is produced.
<b>Keep people away.</b> <b>Avoid inhalation.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Not irritating to eyes, nose or throat. If inhaled, will cause dizziness or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** Currently not available  
2.3 **IMO/UN Designation:** 3.2/1256  
2.4 **DOT ID No.:** 1268  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 128  
2.7 **Standard Industrial Trade Classification:**  
33429

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield (as for gasoline).  
3.2 **Symptoms Following Exposure:** High concentration of vapors may cause intoxication. If liquid is swallowed, it may get into lungs by aspiration; not very irritating to skin or eyes.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air, treat symptoms. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for 15 min. SKIN: wipe off, wash with soap and water.  
3.4 **TLV-TWA:** 400 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 1,000 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
>100°F C.C.  
4.2 **Flammable Limits in Air:** 0.8%-5.0%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 444°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Refined solvent; crude light solvent; crude heavy solvent  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 266–311°F = 130–155°C = 403–428°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.85–0.87 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 19-23 dynes/cm = 0.019–0.023 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 39-51 dynes/cm = 0.039-0.051 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.030  
9.12 **Latent Heat of Vaporization:** 130–150 Btu/lb = 71–81 cal/g = 3.0–3.4 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) –18,200 Btu/lb = –10,100 cal/g = –424 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# NAPHTHA: SOLVENT

NSV

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	53.060	50	0.478	50	1.040	50	9.343
52	53.060	52	0.478	52	1.040	52	8.841
54	53.060	54	0.478	54	1.040	54	8.370
56	53.060	56	0.478	56	1.040	56	7.927
58	53.060	58	0.478	58	1.040	58	7.511
60	53.060	60	0.478	60	1.040	60	7.119
62	53.060	62	0.478	62	1.040	62	6.751
64	53.060	64	0.478	64	1.040	64	6.404
66	53.060	66	0.478	66	1.040	66	6.078
68	53.060	68	0.478	68	1.040	68	5.770
70	53.060	70	0.478	70	1.040	70	5.481
72	53.060	72	0.478	72	1.040	72	5.207
74	53.060	74	0.478	74	1.040	74	4.950
76	53.060	76	0.478	76	1.040	76	4.707
78	53.060	78	0.478	78	1.040	78	4.477
80	53.060	80	0.478	80	1.040	80	4.260
82	53.060	82	0.478	82	1.040	82	4.056
84	53.060	84	0.478	84	1.040	84	3.862
86	53.060	86	0.478	86	1.040	86	3.679
88	53.060	88	0.478	88	1.040	88	3.506
90	53.060	90	0.478	90	1.040	90	3.342
92	53.060	92	0.478	92	1.040	92	3.187
94	53.060	94	0.478	94	1.040	94	3.040
96	53.060	96	0.478	96	1.040	96	2.901
98	53.060	98	0.478	98	1.040	98	2.770
100	53.060	100	0.478	100	1.040	100	2.645

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	90	0.094		N		C
	N	100	0.124		O		U
	S	110	0.163		T		R
	O	120	0.211				R
	L	130	0.272		P		E
	U	140	0.347		E		N
	B	150	0.440		R		T
	I	160	0.553		T		L
	E	170	0.691		I		Y
		180	0.856		N		
		190	1.054		E		N
		200	1.290		N		O
		210	1.569		T		T
		220	1.897				
		230	2.281				A
		240	2.728				V
		250	3.247				A
		260	3.846				I
		270	4.535				L
		280	5.323				A
		290	6.221				B
		300	7.241				L
		310	8.394				E
		320	9.695				
		330	11.160				
		340	12.790				

# 2-NITROANILINE

NTA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Amino-2-nitrobenzene Azotic diazo component 6 o-Nitraniline o-Nitroaniline ONA	Solid  Orange  Musty odor  Sinks and mixes slowly with water.
Keep people away. Avoid contact with solid and dust. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause headache, dizziness, nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 1, 2-C<sub>6</sub>H<sub>4</sub>NO<sub>2</sub>NH<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/1661  
2.4 DOT ID No.: 1661  
2.5 CAS Registry No.: 88-74-4  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51454

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; neoprene gauntlets; safety goggles; rubber or neoprene sealed-tongue work shoes and apron; close-weave cotton coveralls capable of closing at wrist and ankle
- 3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes headache, nausea, methemoglobinemia, vomiting, weakness, and stupor; cyanosis caused by contact usually develops in 4-6 hrs.; prolonged and excessive exposure may also cause liver damage. Contact with eyes or skin causes irritation; continued exposure may cause same symptoms as inhalation or ingestion.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; administer oxygen if required; get medical attention. INGESTION: induce vomiting; get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water; be sure that no solid remains under fingernails or in hair.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5-5 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** 970°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
24 ppm"/daphnia/threshold toxicity/fresh water  
\*Time period not specified.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 100%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 138.1
- 9.3 **Boiling Point at 1 atm:** 543°F = 284°C = 557°K
- 9.4 **Freezing Point:** 160°F = 71°C = 344°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.44 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** -10,000 Btu/lb = -5,550 cal/g = -232 X 10<sup>6</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 27.88 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2-NITROANILINE

NTA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.006		N		N		N
36	0.012		O		O		O
38	0.017		T		T		T
40	0.022						
42	0.028		P		P		P
44	0.033		E		E		E
46	0.039		R		R		R
48	0.044		T		T		T
50	0.049		I		I		I
52	0.054		N		N		N
54	0.060		E		E		E
56	0.065		N		N		N
58	0.070		T		T		T
60	0.076						
62	0.081						
64	0.086						
66	0.092						
68	0.097						
70	0.102						
72	0.108						
74	0.113						
76	0.118						
78	0.124						
80	0.129						
82	0.134						
84	0.140						



# NITROBENZENE

NTB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Essence of mirbane Nitrobenzol Oil of mirbane	Oily liquid  Light yellow to brown  Almond or shoe polish odor  Sinks in water. Freezing point is 41°F.
Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR. Wear chemical protective suit with self-contained breathing apparatus. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS VAPOR IS PRODUCED WHEN HEATED. Wear chemical protective suit with self-contained breathing apparatus. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers in water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 42;  
Nitrocompounds  
2.2 Formula: C<sub>6</sub>H<sub>5</sub>NO<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/1662  
2.4 DOT ID No.: 1662  
2.5 CAS Registry No.: 98-95-3  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification:  
51140

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respirator approved for organic vapors; rubber gloves; splashproof goggles; eyewash fountain, safety shower and medical oxygen supply.
- 3.2 **Symptoms Following Exposure:** Highly toxic when absorbed through the skin, inhaled as vapor, or swallowed. First symptoms are a blue discoloration of the lips, nails, and skin. Acute poisoning produces headache, giddiness, weakness, nausea, vomiting, and coma.
- 3.3 **Treatment of Exposure:** Remove to fresh air and call a physician at once. In case of contact, immediately flush skin or eyes with plenty of water for at least 15 min. If cyanosis (blue discoloration) is present, shower with soap and warm water, with special attention to scalp and fingernails. Administer oxygen until physician arrives.
- 3.4 TLV-TWA: 1 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 50-500 mg/kg (dog)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** 5.94 ppm  
3.13 **IDLH Value:** 200 ppm  
3.14 OSHA PEL-TWA: 1 ppm.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 171°F O.C. 190°F C.C.  
4.2 **Flammable Limits in Air:** 1.8% LEL (UEL not available)  
4.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide, or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Poisonous nitrogen oxides may be produced  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 924°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 2.9 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 34.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
20 ppm/6 hr/minnow/lethal/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 99.5-100%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: U169/D036  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 123.11  
9.3 **Boiling Point at 1 atm:** 411.6°F = 210.9°C = 484.1°K  
9.4 **Freezing Point:** 41.2°F = 5.1°C = 278.3°K  
9.5 **Critical Temperature:** 836.6°F = 447°C = 720.2°K  
9.6 **Critical Pressure:** 700 psia = 47.62 atm = 4.824 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.204 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 43.9 dynes/cm = 0.0439 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 25.66 dynes/cm = 0.02566 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 150 Btu/lb = 85 cal/g = 3.6 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -10,420 Btu/lb = -5,791 cal/g = -242.5 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 22.50 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.01 psia

### NOTES

# NITROBENZENE

NTB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
55	75.549	50	0.360	N O T  P E R T I N E N T		55	2.285
60	75.379	51	0.360			60	2.172
65	75.209	52	0.360			65	2.067
70	75.040	53	0.360			70	1.969
75	74.870	54	0.360			75	1.877
80	74.690	55	0.360			80	1.792
85	74.520	56	0.360			85	1.711
90	74.349	57	0.360			90	1.636
95	74.179	58	0.360			95	1.565
100	74.009	59	0.360			100	1.498
105	73.839	60	0.360			105	1.436
110	73.669	61	0.360			110	1.377
115	73.490	62	0.360			115	1.321
120	73.320	63	0.360			120	1.269
125	73.150	64	0.360			125	1.219
130	72.980	65	0.360			130	1.172
135	72.809	66	0.360			135	1.128
140	72.639	67	0.360			140	1.086
145	72.459	68	0.360			145	1.046
150	72.290	69	0.360			150	1.009
155	72.120	70	0.360			155	0.973
160	71.950	71	0.360				
165	71.780	72	0.360				
170	71.610	73	0.360				
175	71.429	74	0.360				
		75	0.360				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.190	70	0.004	70	0.00008	N O T  P E R T I N E N T	
		80	0.006	80	0.00012		
		90	0.008	90	0.00017		
		100	0.012	100	0.00025		
		110	0.017	110	0.00035		
		120	0.025	120	0.00049		
		130	0.034	130	0.00067		
		140	0.048	140	0.00091		
		150	0.065	150	0.00123		
		160	0.088	160	0.00163		
		170	0.118	170	0.00216		
		180	0.157	180	0.00282		
		190	0.207	190	0.00366		
		200	0.271	200	0.00471		
		210	0.352	210	0.00602		
		220	0.452	220	0.00763		
		230	0.578	230	0.00961		
		240	0.733	240	0.01201		
		250	0.923	250	0.01492		
		260	1.156	260	0.01842		
		270	1.438	270	0.02260		
		280	1.778	280	0.02757		
		290	2.187	290	0.03346		
		300	2.675	300	0.04038		

# NITROSYL CHLORIDE

NTC

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Gas	Orange red	Choking odor
Liquid sinks and reacts with water. Poisonous visible vapor cloud is produced.			
Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Evacuate area in case of large discharge. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.			
Fire	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus.		
Exposure	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: NOCl  
2.3 IMO/UN Designation: 2.0/1069  
2.4 DOT ID No.: 1069  
2.5 CAS Registry No.: 2696-92-6  
2.6 NAERG Guide No.: 125  
2.7 Standard Industrial Trade Classification: 52241

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus (approved mask may be used for short exposures only); rubberized clothing; gloves; shoes; chemical goggles.
- 3.2 **Symptoms Following Exposure:** Gas is highly toxic. Inhalation causes severe irritation of respiratory tract and damage to mucous membranes. Delayed effects, which include severe pulmonary edema, may not be apparent for several hours.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; call a doctor; enforce complete rest until doctor arrives; observe at least 24 hours for delayed effects. SKIN OR EYES: flush with water for at least 15 min.; consult physician.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe burns to eyes and skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Very toxic gases are generated when heated
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves and reacts to form acid solution and toxic red oxides of nitrogen.
- 5.2 **Reactivity with Common Materials:**  
Corrosive to most metals, but reaction is not hazardous.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water. Residual acid may be neutralized with soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: -  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison gas
- 8.2 **49 CFR Class:** 2.3
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 65.46
- 9.3 **Boiling Point at 1 atm:** 21.6°F = -5.8°C = 267.4°K
- 9.4 **Freezing Point:** -74°F = -59°C = 214°K
- 9.5 **Critical Temperature:** 334.4°F = 168°C = 441.2°K
- 9.6 **Critical Pressure:** 1300 psia = 90 atm = 9.1 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.36 at -5.7°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 2.3
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.229
- 9.12 **Latent Heat of Vaporization:** 164 Btu/lb = 91.0 cal/g = 3.81 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# NITROSYL CHLORIDE

NTC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-20	88.599	-2	0.230		N		N
-18	88.429	0	0.230		O		O
-16	88.270	2	0.230		T		T
-14	88.099	4	0.230				
-12	87.929	6	0.230		P		P
-10	87.770	8	0.230		E		E
-8	87.599	10	0.230		R		R
-6	87.429	12	0.230		T		T
-4	87.271	14	0.230		I		I
-2	87.099	16	0.230		N		N
0	86.929	18	0.230		E		E
2	86.770	20	0.230		N		N
4	86.599				T		T
6	86.440						
8	86.270						
10	86.099						
12	85.941						
14	85.770						
16	85.599						
18	85.440						
20	85.270						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	-35	3.202	-35	0.04598	0	0.158
	E	-30	3.723	-30	0.05284	25	0.160
	A	-25	4.314	-25	0.06052	50	0.161
	C	-20	4.982	-20	0.06910	75	0.163
	T	-15	5.735	-15	0.07864	100	0.164
	S	-10	6.581	-10	0.08924	125	0.166
		-5	7.528	-5	0.10100	150	0.167
		0	8.588	0	0.11390	175	0.169
		5	9.768	5	0.12820	200	0.170
		10	11.080	10	0.14390	225	0.171
		15	12.540	15	0.16110	250	0.172
		20	14.150	20	0.17980	275	0.173
		25	15.920	25	0.20030	300	0.175
		30	17.880	30	0.22270	325	0.176
		35	20.030	35	0.24690	350	0.177
		40	22.390	40	0.27330	375	0.178
		45	24.970	45	0.30170	400	0.179
		50	27.790	50	0.33250	425	0.180
		55	30.860	55	0.36570	450	0.180
		60	34.210	60	0.40140	475	0.181
		65	37.840	65	0.43980	500	0.182
						525	0.183
						550	0.183
						575	0.184
						600	0.185

# NITROETHANE

NTE

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid      Colorless      Fruity Odor

May float or sink in water.

Keep people away. Avoid contact with liquid and vapor.  
Shut off ignition sources. Call fire department.  
Stay upwind. Use water spray to "knock down" vapor.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Combustible.  
POISONOUS GASES MAY BE PRODUCED IN FIRE.  
Containers may explode in fire.  
Flashback along vapor trail may occur.  
Vapor may explode if ignited in an enclosed area.  
Wear goggles and self-contained breathing apparatus.  
Extinguish with dry chemicals, foam or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.

#### VAPOR

Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

#### LIQUID

Irritating to skin and eyes.  
If swallowed will cause nausea and vomiting.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump; Dredge  
Do not burn

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{CH}_2\text{NO}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2842  
2.5 CAS Registry No.: 79-24-3  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51140

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Supplied air or self-contained respirator; goggles or face shield; rubber gloves
- 3.2 **Symptoms Following Exposure:** Inhalation causes moderate irritation of respiratory tract. Ingestion causes irritation of mouth and stomach. Contact with liquid causes irritation of eyes and mild irritation of skin.
- 3.3 **Treatment of Exposure:** INHALATION: in case of pulmonary symptoms, give bed rest and oxygen; obtain medical attention at once. INGESTION: give large amount of water. EYES or SKIN: flush with water.
- 3.4 **TLV-TWA:** 100 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50}$  = 860 mg/kg (mouse)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentration unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** 163 ppm
- 3.13 **IDLH Value:** 1,000 ppm
- 3.14 **OSHA PEL-TWA:** 100 ppm.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 105°F O.C. 87°F C.C.
- 4.2 **Flammable Limits in Air:** 3.4% (LFL)
- 4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective; "alcohol" foam is not effective.
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** 778°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 15.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 5.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** May attack some forms of plastics
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (1)  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 92.5+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 3              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 75.07
- 9.3 **Boiling Point at 1 atm:** 237°F = 114°C = 387°K
- 9.4 **Freezing Point:** -130°F = -90°C = 183°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.05 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 31.3 dynes/cm = 0.0313 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 2.6
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.115 at 20°C
- 9.12 **Latent Heat of Vaporization:** 211 Btu/lb = 117 cal/g =  $4.90 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:** -7,720 Btu/lb = -4,290 cal/g =  $-179 \times 10^5$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# NITROETHANE

NTE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	66.719	76	0.439	90	1.178	60	0.745
36	66.650			95	1.169	70	0.697
38	66.580			100	1.159	80	0.654
40	66.509			105	1.149	90	0.615
42	66.440			110	1.140	100	0.580
44	66.379			115	1.130	110	0.547
46	66.309			120	1.121	120	0.518
48	66.240			125	1.111	130	0.491
50	66.169			130	1.101	140	0.466
52	66.099			135	1.092	150	0.443
54	66.030			140	1.082	160	0.422
56	65.959			145	1.072	170	0.403
58	65.889			150	1.063	180	0.385
60	65.820			155	1.053	190	0.369
62	65.750			160	1.043	200	0.353
64	65.679			165	1.034	210	0.339
66	65.610					220	0.325
68	65.540					230	0.313
70	65.469						
72	65.400						
74	65.339						
76	65.270						
78	65.200						
80	65.129						
82	65.059						
84	64.990						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	4.500	60	0.227	60	0.00305	0	0.231
		70	0.309	70	0.00408	20	0.239
		80	0.417	80	0.00540	40	0.246
		90	0.555	90	0.00707	60	0.253
		100	0.733	100	0.00916	80	0.260
		110	0.957	110	0.01175	100	0.267
		120	1.239	120	0.01495	120	0.274
		130	1.590	130	0.01886	140	0.281
		140	2.023	140	0.02360	160	0.288
		150	2.554	150	0.02930	180	0.295
		160	3.201	160	0.03612	200	0.301
		170	3.982	170	0.04422	220	0.308
		180	4.920	180	0.05379	240	0.314
		190	6.039	190	0.06501	260	0.320
		200	7.367	200	0.07810	280	0.326
		210	8.935	210	0.09330	300	0.332
		220	10.770	220	0.11090	320	0.338
		230	12.920	230	0.13100	340	0.344
						360	0.350
						380	0.356
						400	0.361
						420	0.367
						440	0.372
						460	0.378
						480	0.383
						500	0.388

# NAPHTHENIC ACIDS

NTI

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid Gold to black

May float or sink in water.

Keep people away. Avoid contact with liquid and vapor.  
Call fire department.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Combustible.  
Extinguish with dry chemicals, foam or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.

VAPOR  
Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

LIQUID  
Irritating to skin and eyes.  
If swallowed will cause nausea.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $R_2C-CR_2-CR_2-CR_2-(CH_2)_n-COOH$  where  $n = 2-6$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 9137  
2.5 CAS Registry No.: 1338-24-5  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 51385

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Safety glasses or face mask  
3.2 Symptoms Following Exposure: Principal effect is that of mild primary irritation when encountered in high concentrations. Inhalation of vapor causes coughing. Liquid is moderately irritating to eyes and slightly to moderately irritating to skin; excessive exposure could result in dermatitis.  
3.3 Treatment of Exposure: INHALATION: remove to fresh air. INGESTION: give large amounts of water. EYES: flush with water until irritation subsides. SKIN: wash with soap and water; remove contaminated clothing and launder before reuse.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; oral  $LD_{50} = 3,000$  mg/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: 300°F O.C.  
4.2 Flammable Limits in Air: 1.0% (LFL)  
4.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
5-50 ppm/18-60 hr/crayfish/lethal/fresh water  
5.6 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 100%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: A  
7.6 Ship Type: 2  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 200-250 (mixture)  
9.3 Boiling Point at 1 atm: 270–470°F = 132–243°C = 405–516°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.982 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# NAPHTHENIC ACIDS

NTI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
67	61.170		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# NITRALIN

NTL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> N,N-Dipropylaniline 4-(Methylsulfonyl)-2,6-dinitro Planavin	Solid                      Light yellow to orange                      Mild odor  Sinks in water.
<p><b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b>  Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  Call fire department.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	Combustible. Irritating gases are produced when heated. Containers may explode in fire. Combat fires from safe distance or protected location. Flood discharge area with water.
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.  DUST  POISONOUS IF INHALED.  Move victim to fresh air.  If breathing is difficult, give oxygen.</p> <p>SOLID  POISONOUS IF SWALLOWED.  Irritating to skin and eyes.  Remove contaminated clothing and shoes.  Flush affected areas with plenty of water.  IF IN EYES, hold eyelids open and flush with plenty of water.  IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>12</sub>H<sub>10</sub>N<sub>2</sub>O<sub>2</sub>S  
2.3 IMO/UN Designation: 6.1/1609  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 472-61-4  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51454

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Dust mask; rubber gloves.  
3.2 **Symptoms Following Exposure:** Dust irritates eyes. Other forms of exposure produce no observable symptoms.  
3.3 **Treatment of Exposure:** No cases of clinical toxicity on record. Supportive and symptomatic medical treatment recommended if massive overexposure occurs. EYES: flush with water if irritation occurs. SKIN: wash with soap and water. INGESTION: induce vomiting.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> > 2,000 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None observed  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
Not pertinent (combustible solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur and nitrogen are formed in fire.  
4.6 **Behavior in Fire:** Decomposes vigorously in a self-sustaining reaction at or above 225°C  
4.7 **Auto Ignition Temperature:** 435°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 89.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 26.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
27 ppm/96 hr/rainbow trout/LC<sub>50</sub>/fresh water  
1 ppm/96 hr/oysters/no effect/salt water  
6.2 **Waterfowl Toxicity:** No toxicity after 2,000 mg/kg (ducks)  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical: 94+%; Wettable powder: 75%; Emulsifiable concentrate  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 345.2  
9.3 **Boiling Point at 1 atm:** (decomposes)  
>437°F = >225°C = >498°K  
9.4 **Freezing Point:** 304°F = 151°C = 424°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) >1 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** -450 Btu/lb = -250 cal/g = -10.5 X 10<sup>5</sup> J/kg  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# NITRALIN

NTL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# NAPHTHALENE

NTM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Naphthalin Tar camphor	Solid  Colorless  Mothballs odor  Solidifies and floats or sinks in water.
Keep people away. Avoid inhalation. Call fire department. Avoid contact with liquid and solid. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Wear goggles and self-contained breathing apparatus. Extinguish with water, foam, dry chemical or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Skim; Dredge  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 32; Aromatic Hydrocarbon  
**2.2 Formula:** C<sub>10</sub>H<sub>8</sub>  
**2.3 IMO/UN Designation:** 4.1/2304  
**2.4 DOT ID No.:** 1334 (crude/refined); 2304 (molten)  
**2.5 CAS Registry No.:** 91-20-3  
**2.6 NAERG Guide No.:** 133  
**2.7 Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Approved organic vapor canister unit; rubber gloves; chemical safety goggles; face shield; coveralls and/or rubber apron; rubber shoes or boots.  
**3.2 Symptoms Following Exposure:** Vapors or fumes are irritating to eyes, nose, and throat and may cause headaches, dizziness, nausea, etc. Solid may be irritating to skin.  
**3.3 Treatment of Exposure:** INHALATION: remove to fresh air. SKIN OR EYES: flush immediately with plenty of water for at least 15 min.; remove contaminated clothing immediately; call a physician.  
**3.4 TLV-TWA:** 10 ppm  
**3.5 TLV-STEL:** 15 ppm  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 1780 mg/kg  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Hot liquid can cause severe burn. The solid may irritate the skin.  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** 250 ppm  
**3.14 OSHA PEL-TWA:** 10 ppm.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 190°F O.C. 174°F C.C.  
**4.2 Flammable Limits in Air:** 0.9%-5.9%  
**4.3 Fire Extinguishing Agents:** Water fog, carbon dioxide, dry chemical, or foam  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion Products:** Toxic vapors given off in a fire.  
**4.6 Behavior in Fire:** Not pertinent  
**4.7 Auto Ignition Temperature:** 979°F  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** 4.3 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** Molten naphthalene spatters and foams in contact with water. No chemical reaction is involved.  
**5.2 Reactivity with Common Materials:** None  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** 150 mg/l/96 hr/sunfish/TLW/fresh water  
1.8 ppm/72 hr/fingerling salmon/critical/salt water  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** (theor.) 59.5%, 6 days  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Pure; crude: 95% Pure: mp = 176°F Crude: mp = 165-176°F  
**7.2 Storage Temperature:** Elevated  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester) or pressure-vacuum  
**7.5 IMO Pollution Category:** A  
**7.6 Ship Type:** 2  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable solid  
**8.2 49 CFR Class:** 4.1  
**8.3 49 CFR Package Group:** III  
**8.4 Marine Pollutant:** Yes  
**8.5 NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** 100 pounds  
**8.7 EPA Pollution Category:** B  
**8.8 RCRA Waste Number:** U165  
**8.9 EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Solid  
**9.2 Molecular Weight:** 128.18  
**9.3 Boiling Point at 1 atm:** 424°F = 218°C = 491°K  
**9.4 Freezing Point:** 176.4°F = 80.2°C = 353.4°K  
**9.5 Critical Temperature:** 887.4°F = 475.2°C = 748.4°K  
**9.6 Critical Pressure:** 588 psia = 40.0 atm = 4.05 MN/m<sup>2</sup>  
**9.7 Specific Gravity:** 1.145 at 20°C (solid)  
**9.8 Liquid Surface Tension:** 31.8 dynes/cm = 0.0318 N/m at 100°C  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** 1.068  
**9.12 Latent Heat of Vaporization:** 145 Btu/lb = 80.7 cal/g = 3.38 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -16,720 Btu/lb = -9287 cal/g = -388.8 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** 35.06 cal/g  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Low

### NOTES

# NAPHTHALENE

NTM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
177	69.290	180	0.382	177	0.901	180	0.837
178	69.290	200	0.391	178	0.901	185	0.784
179	69.290	220	0.401	179	0.901	190	0.735
180	69.290	240	0.410	180	0.901	195	0.690
181	69.290	260	0.419	181	0.901	200	0.648
182	69.290	280	0.429	182	0.901	205	0.609
183	69.290	300	0.438	183	0.901	210	0.573
184	69.290	320	0.447	184	0.901	215	0.540
185	69.290	340	0.457	185	0.901	220	0.509
186	69.290	360	0.466	186	0.901	225	0.480
187	69.290	380	0.475	187	0.901	230	0.454
188	69.290	400	0.485	188	0.901	235	0.429
189	69.290	420	0.494	189	0.901	240	0.406
190	69.290			190	0.901	245	0.384
191	69.290			191	0.901	250	0.364
192	69.290			192	0.901	255	0.345
193	69.290			193	0.901	260	0.327
						265	0.311
						270	0.295
						275	0.281
						280	0.267
						285	0.254
						290	0.242
						295	0.231
						300	0.221
						305	0.210

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.300	180	0.148	180	0.00276	0	0.207
		200	0.254	200	0.00460	25	0.220
		220	0.420	220	0.00739	50	0.233
		240	0.670	240	0.01143	75	0.246
		260	1.032	260	0.01713	100	0.259
		280	1.544	280	0.02493	125	0.271
		300	2.250	300	0.03537	150	0.283
		320	3.200	320	0.04901	175	0.295
		340	4.453	340	0.06650	200	0.307
		360	6.075	360	0.08850	225	0.318
		380	8.138	380	0.11570	250	0.330
		400	10.720	400	0.14890	275	0.340
		420	13.910	420	0.18890	300	0.351
		440	17.810	440	0.23630	325	0.362
		460	22.490	460	0.29210	350	0.372
		480	28.080	480	0.35680	375	0.382
						400	0.391
						425	0.401
						450	0.410
						475	0.419
						500	0.428
						525	0.436
						550	0.445
						575	0.453
						600	0.460

# NITROUS OXIDE

NTO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dinitrogen monoxide Laughing gas	Gas  Colorless  Odorless or mild sweet odor  Sinks and boils in water. Visible vapor cloud is produced.
Evacuate. Keep people away. Avoid contact with liquid. Avoid inhalation. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable but will intensify fires.
<b>Exposure</b>	Call for medical aid.  VAPOR If inhaled will cause dizziness, difficult breathing, or loss of consciousness. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: N<sub>2</sub>O
- 2.3 IMO/UN Designation: 2/1070
- 2.4 DOT ID No.: 1070
- 2.5 CAS Registry No.: 10024-97-2
- 2.6 NAERG Guide No.: 122
- 2.7 Standard Industrial Trade Classification: 52239

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus for high vapor concentrations
- 3.2 **Symptoms Following Exposure:** Inhalation causes intense analgesia; concentrations of over 40-60% cause loss of consciousness preceded by hysteria. Contact of liquid with eyes or skin causes frostbite burn.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air. EYES: get medical attention for frostbite burn. SKIN: treat frostbite burn; soak in lukewarm water.
- 3.4 TLV-TWA: 50 ppm.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> >15 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes birth defects in rats; can cause lethal effects in chick eggs
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard; practically harmless to the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (nonflammable compressed gas)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Will support combustion, and may increase intensity of fire. Containers may explode when heated.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Supports combustion but does not cause spontaneous ignition.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98.0+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Nonflammable gas
- 8.2 **49 CFR Class:** 2.2
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 44.0
- 9.3 **Boiling Point at 1 atm:** -129.1°F = -89.5°C = 183.7°K
- 9.4 **Freezing Point:** -131.5°F = -90.8°C = 182.4°K
- 9.5 **Critical Temperature:** 97.7°F = 36.5°C = 309.7°K
- 9.6 **Critical Pressure:** 1,054 psia = 71.7 atm = 7.28 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.266 at -89°C (liquid)
- 9.8 **Liquid Surface Tension:** 10.1 dynes/cm = 0.0101 N/m at -25°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 1.53
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.303 at 25°C
- 9.12 **Latent Heat of Vaporization:** 161.7 Btu/lb = 89.9 cal/g = 3.76 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# NITROUS OXIDE

NTO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
32	0.250	-125 -120 -115 -110 -105 -100 -95 -90 -85 -80 -75 -70 -65 -60 -55 -50 -45 -40	16.510 19.220 22.290 25.740 29.600 33.910 38.700 44.000 49.870 56.330 63.430 71.200 79.690 88.940 99.000 109.900 121.700 134.500	-125 -120 -115 -110 -105 -100 -95 -90 -85 -80 -75 -70 -65 -60 -55 -50 -45 -40	0.20220 0.23200 0.26510 0.30170 0.34210 0.38640 0.43490 0.48790 0.54560 0.60810 0.67580 0.74890 0.82760 0.91220 1.00300 1.10000 1.20300 1.31300	90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260	0.211 0.211 0.211 0.211 0.211 0.211 0.211 0.211 0.211 0.211 0.211 0.211 0.211 0.211 0.211 0.211 0.211 0.211

# 2-NITROPHENOL

NTP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Hydroxynitrobenzene o-Nitrophenol ONP	Solid  Yellow   Sinks and mixes slowly with water.
Keep people away. Avoid inhalation. Shut off ignition sources and call fire department. Avoid contact with solid and dust. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause headache or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause headache, nausea, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: 1,2-HOC <sub>6</sub> H <sub>4</sub> NO <sub>2</sub> 2.3 IMO/UN Designation: 6.1/1663 2.4 DOT ID No.: 1663 2.5 CAS Registry No.: 88-75-5 2.6 NAERG Guide No.: 153 2.7 Standard Industrial Trade Classification: 51243
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus for fumes; rubber gloves; goggles 3.2 <b>Symptoms Following Exposure:</b> Inhalation or ingestion causes headache, drowsiness, nausea, and blue color in lips, ears, and fingernails (cyanosis). Contact with eyes causes irritation. Can be absorbed through the intact skin to give same symptoms as for inhalation. 3.3 <b>Treatment of Exposure:</b> INHALATION or INGESTION: remove victim to fresh air; give artificial respiration; call a doctor if symptoms persist. EYES: flush with water for at least 15 min.; get medical attention. SKIN: cleanse thoroughly with soap and water. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 2; oral LD <sub>50</sub> = 1,297 mg/kg (rat) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating fumes of unburned material and oxides of nitrogen can form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 32.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
46.3-51.6 ppm/48 hr/bluegill/TL<sub>m</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 4.2% in 0.94 days, acclimated culture
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; Pure
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U170
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 139.1
- 9.3 **Boiling Point at 1 atm:** 417°F = 214°C = 487°K
- 9.4 **Freezing Point:** 111°F = 44°C = 313°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.49 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** -8,910 Btu/lb = -4,950 cal/g = -207 X 10<sup>6</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 26.76 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# 2-NITROPHENOL

NTP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.097		N		N		N
36	0.103		O		O		O
38	0.110		T		T		T
40	0.117						
42	0.123		P		P		P
44	0.130		E		E		E
46	0.137		R		R		R
48	0.143		T		T		T
50	0.150		I		I		I
52	0.157		N		N		N
54	0.163		E		E		E
56	0.170		N		N		N
58	0.177		T		T		T
60	0.183						
62	0.190						
64	0.197						
66	0.203						
68	0.210						
70	0.217						
72	0.223						
74	0.230						
76	0.237						
78	0.243						
80	0.250						
82	0.257						
84	0.263						



# M-NITROTOLUENE

NTR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 3-Methyl nitrobenzene 3-Nitrotoluene 3-Nitrotoluol	Liquid  Yellow  Characteristic  Sinks and slowly mixes with water.
Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with water spray, carbon dioxide or dry chemical.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR. If inhaled may cause headache, dizziness, nausea, vomiting, and difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID. If swallowed or skin is exposed, may cause headache, dizziness, nausea, vomiting, and difficult breathing. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 42;  
Nitrocompound  
2.2 **Formula:** C<sub>6</sub>H<sub>4</sub>CH<sub>3</sub>NO<sub>2</sub>  
2.3 **IMO/UN Designation:** 6.1/1664  
2.4 **DOT ID No.:** 1664  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 152  
2.7 **Standard Industrial Trade Classification:**  
51140

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective clothing, including butyl rubber gloves and boots, safety goggles or face mask, respirator with approved canister or self-contained breathing apparatus.  
3.2 **Symptoms Following Exposure:** INHALATION, INGESTION OR SKIN ABSORPTION: Headache, flushing of face, dizziness, difficult breathing, cyanosis, nausea, vomiting, muscular weakness, increased pulse and respiratory rate, irritability and convulsions. EYES: Slight irritation. SKIN: Slight irritation.  
3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from source of exposure and keep quiet. EYES: Flush with cold water. SKIN: Wash and scrub body surface including ear canals and nails. INGESTION: Give emetic, gastric lavage followed by saline cathartic.  
3.4 **TLV-TWA:** 2 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Chronic exposure can cause skin, eye, mucous membrane and respiratory irritation. Caused anemia and other blood changes in rats.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to skin.  
3.12 **Odor Threshold:** 1.74 ppm.  
3.13 **IDLH Value:** 200 ppm  
3.14 **OSHA PEL-TWA:** 5 ppm.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 223°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, carbon tetrachloride, or water fog.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Emits toxic fumes of oxides of nitrogen.  
4.6 **Behavior in Fire:** Emits toxic fumes.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 41.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
30 ppm/96 hr/fathead minnow/TL<sub>m</sub>.  
25-20ppm/6 hr/minnow/LC<sub>50</sub>/hard water/21°C  
14-18 ppm/6 hr/minnow/LC<sub>50</sub>/Distilled water/23°C  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
53%/1.66 lb/lb/5 days 62%/1.94 lb/lb/10 days 70%/2.19 lb/lb/15 days 80%/2.50 lb/lb/20 days  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: (T)  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	4

  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 137.13.  
9.3 **Boiling Point at 1 atm:** 450°F = 232.6°C = 505.8°K.  
9.4 **Freezing Point:** 60.8°F = 16.0°C = 289.2°K.  
9.5 **Critical Temperature:** (est.) 899.2°F = 481.8°C = 754.9°K.  
9.6 **Critical Pressure:** (est.) 611.8 psia = 41.6 atm = 4.22 MN/m<sup>2</sup>.  
9.7 **Specific Gravity:** 1.1571 at 20°C.  
9.8 **Liquid Surface Tension:** 39.07 dynes/cm = 0.03907 N/m at 40°C.  
9.9 **Liquid Water Interfacial Tension:** 34.9 dynes/cm = 0.0349 N/m at 40°C.  
9.10 **Vapor (Gas) Specific Gravity:** 4.73.  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) >1.  
9.12 **Latent Heat of Vaporization:** (est.) at boiling point- 155.3 Btu/lb = 86.3 cal/g = 3.61 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -11232 Btu/lb = -6240 cal/g = -261.1 X 10<sup>5</sup> J/kg.  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# M-NITROTOLUENE

NTR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	72.566		C	75	0.967	70	2.292
70	72.242		U	80	0.963	75	2.149
80	71.919		R	85	0.960	80	2.022
90	71.594		R	90	0.956	85	1.910
100	71.270		E	95	0.953	90	1.810
110	70.945		N	100	0.949	95	1.719
120	70.622		T	105	0.946	100	1.638
130	70.297		L	110	0.942	105	1.563
140	69.973		Y	115	0.938	110	1.495
150	69.648			120	0.935	115	1.433
160	69.325		N			120	1.376
170	69.000		O			125	1.323
180	68.676		T			130	1.274
190	68.351					135	1.229
200	68.028		A			140	1.186
210	67.704		V				
220	67.379		A				
230	67.054		I				
240	66.731		L				
			A				
			B				
			L				
			E				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
86	0.050	70	0.003	70	0.00007		C
		75	0.004	75	0.00009		U
		80	0.004	80	0.00010		R
		85	0.005	85	0.00012		R
		90	0.006	90	0.00014		E
		95	0.007	95	0.00017		N
		100	0.009	100	0.00020		T
		105	0.010	105	0.00023		L
		110	0.012	110	0.00028		Y
		115	0.015	115	0.00032		
		120	0.017	120	0.00038		N
		125	0.021	125	0.00045		O
		130	0.024	130	0.00053		T
		135	0.029	135	0.00062		
		140	0.034	140	0.00073		A
							V
							A
							I
							L
							A
							B
							L
							E

# P-NITROTOLUENE

NTT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methyl nitrobenzene 4-Methyl nitrobenzene 4-Nitrotoluol Toluene, p-nitro-	Solid (crystalline)      Yellow      Bitter almond  Sinks in water.
<b>Keep people away. Avoid contact with solid and dust.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves.)</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with carbon dioxide or dry chemical. Water or foam may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST OR SOLID If inhaled, swallowed, or skin is exposed, may cause headache, dizziness, nausea, vomiting, and difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 42; Nitrocompound <b>2.2 Formula:</b> C <sub>7</sub> H <sub>7</sub> NO <sub>2</sub> <b>2.3 IMO/UN Designation:</b> 6.1/1664 <b>2.4 DOT ID No.:</b> 1664 <b>2.5 CAS Registry No.:</b> 99-99-0 <b>2.6 NAERG Guide No.:</b> 152 <b>2.7 Standard Industrial Trade Classification:</b> 51140
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Wear butyl rubber gloves, protective clothing and shoes, and self-contained breathing apparatus. <b>3.2 Symptoms Following Exposure:</b> INHALATION, INGESTION, OR SKIN: Headache, flushed face, dizziness, dyspnea (difficult breathing), cyanosis, nausea, vomiting, muscular weakness, rapid pulse and respiration, irritability, and convulsions. <b>3.3 Treatment of Exposure:</b> Call a physician. INHALATION: Move to fresh air. EYES: Flush with water. SKIN: Wash with soap and water. INGESTION: Gastric lavage and catharsis. <b>3.4 TLV-TWA:</b> 2 ppm <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg. <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Moderate methemoglobin formation; moderate kidney and liver damage. Changes in conditioned reflex activity with high dosage. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Currently not available <b>3.11 Liquid or Solid Characteristics:</b> Currently not available <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> 200 ppm <b>3.14 OSHA PEL-TWA:</b> 5 ppm. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 223°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** CO<sub>2</sub>, dry chemical  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water, foam  
**4.5 Special Hazards of Combustion Products:** Yields toxic oxides of nitrogen when burning.  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 41.6 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 11.5 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** Currently not available  
**5.3 Stability During Transport:** Currently not available  
**5.4 Neutralizing Agents for Acids and Caustics:** Currently not available  
**5.5 Polymerization:** Currently not available  
**5.6 Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
10 to 22 ppm/6-hour/TL<sub>m</sub>/Minnow/distilled water  
45 to 50 ppm/6-hour/TL<sub>m</sub>/Minnow/hard water  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: (T)  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Currently not available  
**7.2 Storage Temperature:** Cool  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** B  
**7.6 Ship Type:** 2  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Poison  
**8.2 49 CFR Class:** 6.1  
**8.3 49 CFR Package Group:** II  
**8.4 Marine Pollutant:** Yes  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	1

**8.6 EPA Reportable Quantity:** 1000 pounds  
**8.7 EPA Pollution Category:** C  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Solid  
**9.2 Molecular Weight:** 137.15  
**9.3 Boiling Point at 1 atm:** 461°F = 238.3°C = 511.5°K  
**9.4 Freezing Point:** 125°F = 51.7°C = 324.9°K  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 1.286 at 20°C  
**9.8 Liquid Surface Tension:** 36.83 dynes/cm = 0.03683 N/m at 60°C 35.64 dynes/cm = 0.03564 N/m at 70°C  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** 4.72  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** 157 Btu/lb = 87 cal/g = 3.64 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -11,181 Btu/lb = -6212 cal/g = -260 X 10<sup>3</sup> J/kg  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# P-NITROTOLUENE

NTT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	140 142 144 146 148 150 152 154 156 158 160 162 164 166	1.173 1.152 1.132 1.114 1.096 1.080 1.064 1.050 1.036 1.023 1.010 0.998 0.987 0.976

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	135 140 145 150 155 160 165 170 175	0.024 0.027 0.031 0.036 0.042 0.048 0.056 0.064 0.074	135 140 145 150 155 160 165 170 175 180 185 190	0.00050 0.00058 0.00068 0.00078 0.00090 0.00103 0.00117 0.00133 0.00150 0.00170 0.00190 0.00213		C U R R E N T L Y  N O T  A V A I L A B L E

# NITRIC OXIDE

NTX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Mononitrogen monoxide Nitrogen monoxide	Compressed gas      Colorless      Sharp unpleasant odor  Reacts with water. Poisonous red-brown vapor cloud is produced.
Evacuate. <b>KEEP PEOPLE AWAY. AVOID CONTACT WITH GAS.</b> Wear goggles and self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:** NO
- 2.3 **IMO/UN Designation:** 2/1660
- 2.4 **DOT ID No.:** 1660
- 2.5 **CAS Registry No.:** 10102-43-9
- 2.6 **NAERG Guide No.:** 124
- 2.7 **Standard Industrial Trade Classification:** 52239

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus or gas mask with universal canister
- 3.2 **Symptoms Following Exposure:** Continued inhalation of low concentrations causes chronic irritation, cough, headache, corrosion of teeth, loss of strength; symptoms from overexposure to higher concentrations (which may be delayed for 6-24 hours) include irritation of nose and throat, tightness in chest, difficult breathing, pallor, loss of consciousness, and death; pulmonary edema occurs; if patient recovers, pneumonia may develop.
- 3.3 **Treatment of Exposure:** Get medical attention at once following inhalation of this gas. **INHALATION:** if breathing has stopped, give artificial respiration with 100% oxygen; keep victim quiet and warm; keep head and chest lower than hips, to aid in drainage from lungs; alert physician to possibility of delayed pulmonary edema during 6-24 hours.
- 3.4 **TLV-TWA:** 25 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent (gas at normal temperatures)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 100 ppm
- 3.14 **OSHA PEL-TWA:** 25 ppm.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (nonflammable compressed gas)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Supports combustion, so all fires burn more vigorously.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with water to form nitric acid. The reaction is not violent.
- 5.2 **Reactivity with Common Materials:**  
Reacts rapidly with air to form nitrogen tetroxide; see this compound.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Not pertinent
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** C.P.: 99+%
- 7.2 **Storage Temperature:** Cool ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief. Containers must be in well-ventilated area.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison gas
- 8.2 **49 CFR Class:** 2.3
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** P076
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 30.0
- 9.3 **Boiling Point at 1 atm:** -241.1°F = -151.7°C = 121.5°K
- 9.4 **Freezing Point:** -262.5°F = -163.6°C = 109.6°K
- 9.5 **Critical Temperature:** 847.4°F = 453°C = 726.2°K
- 9.6 **Critical Pressure:** 940 psia = 64 atm = 6.5 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** Not pertinent
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 1.6 (nitrogen dioxide)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.400 at 15°C
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -257 Btu/lb = -143 cal/g = 5.98 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 18.3 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# NITRIC OXIDE

NTX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T	0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250	0.233 0.233

# NAPHTHA: VM & P

NVM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Light naphtha Painter's naphtha Petroleum solvent	Watery liquid      Colorless      Gasoline-like odor  Floats on water. Flammable, irritating vapor is produced.
Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with foam, dry chemical or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause dizziness or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. <b>DO NOT INDUCE VOMITING.</b>
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

**2.1 CG Compatibility Group:** 33;  
 Miscellaneous Hydrocarbon Mixtures  
**2.2 Formula:** Not applicable  
**2.3 IMO/UN Designation:** 3.2/1255  
**2.4 DOT ID No.:** 1268  
**2.5 CAS Registry No.:** Currently not available  
**2.6 NAERG Guide No.:** 128  
**2.7 Standard Industrial Trade Classification:**  
 33429

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Goggles or face shield (as for gasoline).  
**3.2 Symptoms Following Exposure:** Vapor irritates respiratory tract, causes coughing and mild depression. Aspiration causes severe lung irritation with coughing, gagging, and rapidly developing pulmonary edema. Ingestion irritates mouth and stomach, causes nausea, vomiting, swelling of abdomen, cardiac arrhythmias.  
**3.3 Treatment of Exposure:** INHALATION: maintain respiration if required. INGESTION: do NOT induce vomiting; observe for pneumonia; support if central nervous system depression occurs. ASPIRATION: enforce rest; administer oxygen; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.  
**3.4 TLV-TWA:** 300 ppm  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** None  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:**  
 20-55°F C.C.  
**4.2 Flammable Limits in Air:** 0.9%-6.7%  
**4.3 Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Vapor is heavier than air and may travel long distances to a source of ignition and flash back.  
**4.7 Auto Ignition Temperature:** 450°F  
**4.8 Electrical Hazards:** Class I, Group D  
**4.9 Burning Rate:** 4 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent.  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
 Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):**  
 Currently not available  
**6.4 Food Chain Concentration Potential:**  
 None  
**6.5 GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Petroleum hydrocarbons (90%) plus aromatic hydrocarbons such as benzene and toluene (10%)  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester) or pressure-vacuum  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid  
**8.2 49 CFR Class:** 3  
**8.3 49 CFR Package Group:** I  
**8.4 Marine Pollutant:** Yes  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** Not pertinent  
**9.3 Boiling Point at 1 atm:** 200–300°F = 93–149°C = 366–422°K  
**9.4 Freezing Point:** Not pertinent  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 0.75 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** 19–23 dynes/cm = 0.019–0.023 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** 39–51 dynes/cm = 0.039–0.051 N/m at 20°C.  
**9.10 Vapor (Gas) Specific Gravity:** Currently not available  
**9.11 Ratio of Specific Heats of Vapor (Gas):**  
 (est.) 1.030  
**9.12 Latent Heat of Vaporization:** 130–150 Btu/lb = 71–81 cal/g = 3.0–3.4 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** (est.) –18,200 Btu/lb = –10,100 cal/g = –424 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 0.12 psia

### NOTES

# NAPHTHA: VM & P

NVM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	46.820	50	0.478	50	1.040	50	9.343
52	46.820	52	0.478	52	1.040	52	8.841
54	46.820	54	0.478	54	1.040	54	8.370
56	46.820	56	0.478	56	1.040	56	7.927
58	46.820	58	0.478	58	1.040	58	7.511
60	46.820	60	0.478	60	1.040	60	7.119
62	46.820	62	0.478	62	1.040	62	6.751
64	46.820	64	0.478	64	1.040	64	6.404
66	46.820	66	0.478	66	1.040	66	6.078
68	46.820	68	0.478	68	1.040	68	5.770
70	46.820	70	0.478	70	1.040	70	5.481
72	46.820	72	0.478	72	1.040	72	5.207
74	46.820	74	0.478	74	1.040	74	4.950
76	46.820	76	0.478	76	1.040	76	4.707
78	46.820	78	0.478	78	1.040	78	4.477
80	46.820	80	0.478	80	1.040	80	4.260
82	46.820	82	0.478	82	1.040	82	4.056
84	46.820	84	0.478	84	1.040	84	3.862
86	46.820	86	0.478	86	1.040	86	3.679
88	46.820	88	0.478	88	1.040	88	3.506
90	46.820	90	0.478	90	1.040	90	3.342
92	46.820	92	0.478	92	1.040	92	3.187
94	46.820	94	0.478	94	1.040	94	3.040
96	46.820	96	0.478	96	1.040	96	2.901
98	46.820	98	0.478	98	1.040	98	2.770
100	46.820	100	0.478	100	1.040	100	2.645

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	90	0.094		N		C
	N	100	0.124		O		U
	S	110	0.163		T		R
	O	120	0.211				R
	L	130	0.272		P		E
	U	140	0.347		E		N
	B	150	0.440		R		T
	L	160	0.553		T		L
	E	170	0.691		I		Y
		180	0.856		N		
		190	1.054		E		N
		200	1.290		N		O
		210	1.569		T		T
		220	1.897				
		230	2.281				A
		240	2.728				V
		250	3.247				A
		260	3.846				I
		270	4.535				L
		280	5.323				A
		290	6.221				B
		300	7.241				L
		310	8.394				E
		320	9.695				
		330	11.160				
		340	12.790				



# NITROGEN

NXX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Liquid nitrogen	Gas Colorless Odorless  Floats and boils on water.
Keep people away. Avoid contact with liquid.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	Call for medical aid.  VAPOR Not harmful. In high concentrations may cause dizziness, difficult breathing, or loss of consciousness.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: N<sub>2</sub>
- 2.3 IMO/UN Designation: 2/1977
- 2.4 DOT ID No.: 1066
- 2.5 CAS Registry No.: 7727-37-9
- 2.6 NAERG Guide No.: 121
- 2.7 Standard Industrial Trade Classification: 52221

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses or face shield; insulated gloves; long sleeves; trousers worn outside boots or over high-top shoes to shed spilled liquid; self-contained breathing apparatus where insufficient air is present.
- 3.2 **Symptoms Following Exposure:** Inhalation can cause asphyxiation, if atmosphere does not contain oxygen; dizziness, unconsciousness, or even death can result. Contact of liquid with skin or eyes causes frostbite burns.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; apply artificial respiration if breathing has stopped; call physician. EYES: treat for frostbite burns caused by liquid. SKIN: treat for frostbite; soak in lukewarm water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** None
- 3.11 **Liquid or Solid Characteristics:** Frostbite
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (nonflammable compressed gas)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode when heated.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Heat of water will vigorously vaporize liquid nitrogen.
- 5.2 **Reactivity with Common Materials:** No chemical reaction. Low temperature may cause brittleness in rubber and plastics.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.5+%
- 7.2 **Storage Temperature:** -320°F
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Nonflammable gas
- 8.2 **49 CFR Class:** 2.2
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 28.0
- 9.3 **Boiling Point at 1 atm:** -320.1°F = -195.6°C = 77.6°K
- 9.4 **Freezing Point:** -354°F = -215°C = 58°K
- 9.5 **Critical Temperature:** -232.6°F = -147.0°C = 126.2°K
- 9.6 **Critical Pressure:** 493 psia = 33.5 atm = 3.40 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.807 at -195.5°C (liquid)
- 9.8 **Liquid Surface Tension:** 8.3 dynes/cm = 0.083 N/m at -193°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 0.965
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.3962
- 9.12 **Latent Heat of Vaporization:** 95 Btu/lb = 53 cal/g = 2.2 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 6.15 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# NITROGEN

NXX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-327	51.850	-327	0.240	-326	0.993	-325	0.170
-326	51.640	-326	0.240	-324	0.983	-320	0.155
-325	51.440	-325	0.240	-322	0.973	-315	0.143
-324	51.230	-324	0.240	-320	0.964	-310	0.132
-323	51.020	-323	0.240	-318	0.954	-305	0.123
-322	50.810	-322	0.240	-316	0.944	-300	0.114
-321	50.600	-321	0.240	-314	0.934	-295	0.107
-320	50.400	-320	0.240	-312	0.924	-290	0.101
-319	50.190	-319	0.240	-310	0.914	-285	0.095
-318	49.980	-318	0.240	-308	0.904	-280	0.090
-317	49.770	-317	0.240	-306	0.895	-275	0.086
-316	49.560	-316	0.240	-304	0.885	-270	0.082
-315	49.360	-315	0.240	-302	0.875	-265	0.078
-314	49.150	-314	0.240	-300	0.865	-260	0.075
-313	48.940	-313	0.240	-298	0.855		
-312	48.730	-312	0.240	-296	0.845		
-311	48.520	-311	0.240	-294	0.835		
-310	48.320	-310	0.240	-292	0.826		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	-344	1.931	-344	0.04355	0	0.250
	N	-342	2.356	-342	0.05223	20	0.250
	S	-340	2.855	-340	0.06224	40	0.250
	O	-338	3.438	-338	0.07372	60	0.250
	L	-336	4.116	-336	0.08681	80	0.250
	U	-334	4.899	-334	0.10170	100	0.250
	B	-332	5.799	-332	0.11850	120	0.250
	L	-330	6.828	-330	0.13740	140	0.250
	E	-328	8.000	-328	0.15850	160	0.250
		-326	9.330	-326	0.18210	180	0.250
		-324	10.830	-324	0.20820	200	0.250
		-322	12.520	-322	0.23720	220	0.250
		-320	14.410	-320	0.26910	240	0.250
		-318	16.520	-318	0.30410	260	0.250
		-316	18.870	-316	0.34250	280	0.250
		-314	21.470	-314	0.38440	300	0.250
		-312	24.340	-312	0.43000	320	0.250
		-310	27.510	-310	0.47950	340	0.250
		-308	30.990	-308	0.53300	360	0.250
		-306	34.800	-306	0.59080	380	0.250
		-304	38.970	-304	0.65300	400	0.250
		-302	43.510	-302	0.71980	420	0.250
		-300	48.440	-300	0.79130	440	0.250
		-298	53.790	-298	0.86780		
		-296	59.570	-296	0.94940		
		-294	65.820	-294	1.03600		

## OCTANOIC ACID

OAA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> C-8 acid n-Caprylic acid 1-Heptanecarboxylic acid Hexacid 898 Neo-fat 8 n-Octoic acid	Oily liquid	Colorless	Slightly unpleasant, rancid taste
<b>Keep people away.</b> <b>Avoid contact with liquid and vapor.</b> <b>Wear rubber overclothing (including gloves).</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b>			
<b>Fire</b>	Combustible. Water may be ineffective on fire. Wear self-contained breathing apparatus and protective clothing including rubber boots and heavy rubber gloves. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> .		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed, will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	May be dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 4; Organic acids.  
2.2 Formula: CH<sub>3</sub>(CH<sub>2</sub>)<sub>6</sub>CO<sub>2</sub>H  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 124-07-2  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51377

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full face self contained breathing apparatus, rubber boots, and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** Harmful if swallowed, inhaled, or absorbed through skin. Material is extremely destructive to tissues of mucous membrane, and upper respiratory tract, eyes and skin. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness or breath, headache, nausea and vomiting.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES - OR - SKIN: Flush with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes. Assure adequate flushing of the eyes by separating the eyelids with the fingers.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 1; LD<sub>50</sub> = 10.08 g/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.
- 3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 230°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam, water spray.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Corrosive, attacks most common metals.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate solution.  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.5+%  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 144.21  
9.3 **Boiling Point at 1 atm:** 458.6°F = 237°C = 510.2°K  
9.4 **Freezing Point:** 60.8-61.7°F = 16-16.5°C = 289.2-289.7°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.910  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# OCTANOIC ACID

OAA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.068	172 237 255 277 303 320 342 375 417 460	0.019 0.097 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.312 0.324 0.337 0.349 0.362 0.374 0.385 0.397 0.408 0.419 0.430 0.441 0.451 0.461 0.471 0.481 0.491 0.500 0.510 0.519 0.528 0.536 0.545 0.553 0.561

# OLEIC ACID, SODIUM SALT

OAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Eunatrol Sodium oleate	Solid	Light tan	Slight tallow-like odor
	Sinks and mixes slowly with water.		
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, foam, or carbon dioxide.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_{17}H_{33}COONa$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 143-19-1
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51378

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask and gloves
- 3.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat, coughing, and sneezing. Ingestion causes mild irritation of mouth. Contact with eyes causes irritation.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water. EYES: flush with copious quantities of tap water. SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent (combustible solid)
- 4.2 Flammable Limits in Air: Not pertinent
- 4.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Currently not available
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 121.4 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 35.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 1
  - Human Oral hazard: 0
  - Human Contact hazard: I
  - Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 304 (approx.)
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: 450–455°F = 232–235°C = 505–508°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: >1.1 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# OLEIC ACID, SODIUM SALT

OAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	10.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# OCTYL ALDEHYDES

OAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Octanal n-Octyl aldehyde	Liquid  Colorless  Strong, fruity odor  Floats on water.
Keep people away. Avoid contact with liquid. Wear goggles, self-contained breathing apparatus, and rubber overclothing. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 19; Aldehydes  
2.2 Formula:  $C_8H_{16}CHO$   
2.3 IMO/UN Designation: 3.3/1191  
2.4 DOT ID No.: 1191  
2.5 CAS Registry No.: 124-13-0 (n-Octyl isomer)  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; safety goggles or face shield.  
3.2 **Symptoms Following Exposure:** Inhalation may be irritating to mucous membrane; overexposure may cause dizziness and collapse. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation.  
3.3 **Treatment of Exposure:** Call for medical aid. INHALATION: Remove victim to fresh air; give oxygen if breathing is difficult. EYES: Irrigate immediately for 15 min. with water, lifting lids occasionally. SKIN: Flush with water; wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat  $LD_{50}$  = 3,730 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 125°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 54.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: -  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 95.0+%  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Pressure vacuum valve.  
7.5 **IMO Pollution Category:** (B)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 128.22  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.82 - 0.83  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OCTYL ALDEHYDES

OAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# OCTANE

OAN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Octane	Liquid	Colorless	Gasoline-like odor
Floats on water. Flammable, irritating vapor is produced.			
Keep people away. Avoid contact with liquid. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, difficult breathing, or loss of consciousness. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea, and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 31; Paraffin  
2.2 Formula: C<sub>8</sub>H<sub>18</sub>  
2.3 IMO/UN Designation: 3.2/1262  
2.4 DOT ID No.: 1262  
2.5 CAS Registry No.: 111-65-9  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51114

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus for high vapor concentrations; goggles or face shield; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Inhalation of concentrated vapor may cause irritation of respiratory tract, depression, and pulmonary edema. Liquid can cause irritation of eyes and (on prolonged contact) irritation and cracking of skin. Ingestion causes irritation of mouth and stomach. Aspiration causes severe lung irritation, rapidly developing pulmonary edema, and central nervous system excitement, followed by depression.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; apply artificial respiration if breathing has stopped; call physician if needed. EYES: irrigate with copious quantities of water for 15 min. SKIN: flush with water; wash with soap and water. INGESTION: do NOT induce vomiting; call physician. ASPIRATION: enforce bed rest; give oxygen; get medical attention.
- 3.4 TLV-TWA: 300 ppm  
3.5 TLV-STEL: 375 ppm  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: 4 ppm  
3.13 IDLH Value: 1,000 ppm  
3.14 OSHA PEL-TWA: 500 ppm.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 56°F C.C.  
4.2 Flammable Limits in Air: 1.0% 6.5%  
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
4.7 Auto Ignition Temperature: 428°F  
4.8 Electrical Hazards: Class I, Group D  
4.9 Burning Rate: 6.3 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 59.5 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 17.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: (1)  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Research: 99.92%; Pure: 99.6%; Technical: 98.7%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: (C)  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCL List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 114.2  
9.3 Boiling Point at 1 atm: 258.1°F = 125.6°C = 398.9°K  
9.4 Freezing Point: -70.2°F = -56.8°C = 216.4°K  
9.5 Critical Temperature: 563.7°F = 295.4°C = 568.6°K  
9.6 Critical Pressure: 361 psia = 24.5 atm = 2.49 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.703 at 20°C (liquid)  
9.8 Liquid Surface Tension: 21.7 dynes/cm = 0.0217 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 35 dynes/cm = 0.035 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: 3.9  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.047 at 16°C  
9.12 Latent Heat of Vaporization: 130.4 Btu/lb = 72.5 cal/g = 3.03 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -19,112 Btu/lb = -10,618 cal/g = -444.26 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 43.21 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# OCTANE

OAN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	45.890	0	0.494	0	0.987	40	0.667
10	45.590	5	0.496	5	0.992	50	0.619
20	45.300	10	0.498	10	0.976	60	0.575
30	45.000	15	0.500	15	0.970	70	0.537
40	44.710	20	0.503	20	0.965	80	0.502
50	44.410	25	0.505	25	0.959	90	0.471
60	44.120	30	0.507	30	0.954	100	0.442
70	43.820	35	0.509	35	0.948	110	0.416
80	43.530	40	0.512	40	0.942	120	0.393
90	43.230	45	0.514	45	0.937	130	0.371
100	42.940	50	0.516	50	0.931	140	0.352
110	42.640	55	0.518	55	0.926	150	0.334
120	42.350	60	0.520	60	0.920	160	0.317
130	42.060	65	0.523	65	0.914	170	0.302
140	41.760	70	0.525	70	0.909	180	0.288
150	41.470	75	0.527	75	0.903	190	0.275
160	41.170	80	0.529	80	0.898	200	0.263
170	40.880	85	0.532	85	0.892	210	0.252
		90	0.534	90	0.886		
		95	0.536	95	0.881		
		100	0.538	100	0.875		
		105	0.540				
		110	0.543				
		115	0.545				
		120	0.547				
		125	0.549				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
60	0.002	70	0.227	70	0.00456	0	0.353
		80	0.305	80	0.00600	25	0.366
		90	0.404	90	0.00783	50	0.380
		100	0.532	100	0.01011	75	0.393
		110	0.692	110	0.01293	100	0.406
		120	0.893	120	0.01639	125	0.419
		130	1.142	130	0.02061	150	0.432
		140	1.449	140	0.02571	175	0.446
		150	1.824	150	0.03183	200	0.459
		160	2.279	160	0.03913	225	0.472
		170	2.828	170	0.04777	250	0.485
		180	3.484	180	0.05795	275	0.498
		190	4.266	190	0.06986	300	0.512
		200	5.192	200	0.08372	325	0.525
		210	6.281	210	0.09977	350	0.538
		220	7.555	220	0.11830	375	0.551
		230	9.041	230	0.13950	400	0.564
		240	10.760	240	0.16360	425	0.577
		250	12.750	250	0.19110	450	0.591
		260	15.030	260	0.22220	475	0.604
						500	0.617
						525	0.630
						550	0.643
						575	0.657
						600	0.670

# OLEIC ACID, POTASSIUM SALT

OAP

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms Potassium oleate	Solid or liquid	Brown	Soapy odor
	Sinks and mixes slowly with water.		
Keep people away. Avoid contact with liquid and solid. Notify local health and pollution control agencies. Protect water intakes.			
Fire	Combustible. Extinguish with water, dry chemicals, alcohol foam, or carbon dioxide.		
Exposure	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_{17}H_{33}COOK$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51378

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical goggles and rubber gloves
- 3.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat, coughing, and sneezing. Ingestion causes mild irritation of mouth and stomach. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water. EYES: flush with copious quantities of tap water for 15 min. and seek appropriate medical attention. SKIN: flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 140°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 121.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 35.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: O
  - Damage to living resources: (2)
  - Human Oral hazard: -
  - Human Contact hazard: I
  - Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 19% solution in water
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid or liquid
- 9.2 **Molecular Weight:** 320 (solute only)
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 455–464°F = 235–240°C = 508–513°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** >1.1 at 20°C (solid or liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OLEIC ACID, POTASSIUM SALT

OAP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	25.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# OILS, MISCELLANEOUS: ABSORPTION

OAS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Absorbent oil	Liquid  Colorless to pale yellow  Fuel oil odor  Floats on water.
Keep people away. Avoid contact with liquid. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** Not applicable  
2.3 **IMO/UN Designation:** 3.3/1270  
2.4 **DOT ID No.:** 1270  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 128  
2.7 **Standard Industrial Trade Classification:** 33429

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** INGESTION: irritation of stomach. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure. (Delayed development can be detected by serial chest x-rays.)  
3.3 **Treatment of Exposure:** INGESTION: have victim drink water or milk; do NOT induce vomiting. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5-15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** None  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 255°F  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 300°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Combustible liquid  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Currently not available  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** >500°F = >260°C = >533°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) 0.85 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -18,000 Btu/lb = -10,000 cal/g = -420 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, MISCELLANEOUS: ABSORPTION

OAS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	53.060	50	0.460	35	0.920	100	7.650
52	53.060	52	0.461	40	0.919		
54	53.060	54	0.462	45	0.918		
56	53.060	56	0.463	50	0.917		
58	53.060	58	0.464	55	0.916		
60	53.060	60	0.465	60	0.915		
62	53.060	62	0.466	65	0.914		
64	53.060	64	0.467	70	0.913		
66	53.060	66	0.468	75	0.912		
68	53.060	68	0.469	80	0.911		
70	53.060	70	0.470	85	0.910		
72	53.060	72	0.471	90	0.909		
74	53.060	74	0.472	95	0.908		
76	53.060	76	0.473	100	0.907		
78	53.060	78	0.474	105	0.906		
80	53.060	80	0.475	110	0.905		
82	53.060	82	0.476	115	0.904		
84	53.060	84	0.477	120	0.903		
		86	0.478				
		88	0.479				
		90	0.480				
		92	0.481				
		94	0.482				
		96	0.483				
		98	0.484				
		100	0.485				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OILS, EDIBLE: CASTOR

OCA

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Oily liquid      Light yellow to green      Weak odor

Floats on water.

Call fire department.  
Notify local health and pollution control agencies.

### Fire

Combustible.  
Extinguish with dry chemical, foam or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

Not harmful.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 9899

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield.  
3.2 **Symptoms Following Exposure:** If ingested causes severe diarrhea.  
3.3 **Treatment of Exposure:** INGESTION: if more than 2 tablespoons, consult physician. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg (Fatal dose unknown but presumably large).  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Not pertinent  
3.10 **Vapor (Gas) Irritant Characteristics:** None  
3.11 **Liquid or Solid Characteristics:** None  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 445°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 840°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; meets Mil. Specs. and ASTM; USP; USP Odorless; Technical. All grades differ only in color and acid values.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Varies, depending on composition  
9.4 **Freezing Point:** 10°F = -12°C = 261°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.96 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** 39 dynes/cm = 0.039 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 19.2 dynes/cm = 0.0192 N/m at 22°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -15,950 Btu/lb = -8,860 cal/g = -371.0 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.10 psia

## NOTES

# OILS, EDIBLE: CASTOR

OCA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	60.860	35	0.478	70	1.206	50	3909.000
52	60.790	40	0.478	80	1.206	55	3027.000
54	60.720	45	0.478	90	1.206	60	2356.000
56	60.650	50	0.478	100	1.206	65	1842.000
58	60.580	55	0.478	110	1.206	70	1448.000
60	60.510	60	0.478	120	1.206	75	1142.000
62	60.450	65	0.478	130	1.206	80	905.500
64	60.380	70	0.478	140	1.206	85	720.799
66	60.310	75	0.478	150	1.206	90	576.199
68	60.240	80	0.478	160	1.206	95	462.399
70	60.170	85	0.478	170	1.206	100	372.599
72	60.100	90	0.478	180	1.206	105	301.399
74	60.030	95	0.478	190	1.206	110	244.699
76	59.960	100	0.478	200	1.206	115	199.299
78	59.890			210	1.206	120	163.000
80	59.820			220	1.206	125	133.699
82	59.750			230	1.206	130	110.099
84	59.680			240	1.206	135	90.940
86	59.610			250	1.206		
88	59.540			260	1.206		
90	59.470						
92	59.410						
94	59.340						
96	59.270						
98	59.200						
100	59.130						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	35	0.013		N		N
	N	40	0.016		O		O
	S	45	0.018		T		T
	O	50	0.022				
	L	55	0.026		P		P
	U	60	0.030		E		E
	B	65	0.035		R		R
	L	70	0.041		T		T
	E	75	0.048		I		I
		80	0.056		N		N
		85	0.065		E		E
		90	0.075		N		N
		95	0.086		T		T
		100	0.099				
		105	0.113				
		110	0.129				
		115	0.147				
		120	0.168				



# OILS, EDIBLE: COCONUT

OCC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Coconut butter Coconut oil Copra oil	Solid or liquid  Floats on water.	Light yellow to orange	Weak odor
Call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.		
<b>Exposure</b>	LIQUID OR SOLID Not harmful. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Ester
- 2.2 Formula: Not applicable
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 9899

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Oil is essentially nontoxic, but can cause mild irritation of eyes on contact.
- 3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 420°F C.C. (crude) 580°F C.C. (refined)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing; water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 4 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Crude; Cochín. All grades contain 3-5% free fatty acids.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid or liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** Not pertinent (very high)
- 9.4 **Freezing Point:** (approx.) 76°F = 24°C = 297°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.922 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** 33.4 dynes/cm = 0.0334 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 25°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) =-15,500 Btu/lb = -8,600 cal/g = -360 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

NOTES

# OILS, EDIBLE: COCONUT

OCC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
78	57.400	78	0.480	76	1.156	90	32.590
80	57.350	80	0.480	78	1.155	95	29.720
82	57.290	82	0.480	80	1.155	100	27.150
84	57.230	84	0.480	82	1.154	105	24.850
86	57.180	86	0.480	84	1.154	110	22.770
88	57.120	88	0.480	86	1.153	115	20.900
90	57.070	90	0.480	88	1.153	120	19.210
92	57.010	92	0.480	90	1.152	125	17.680
94	56.960	94	0.480	92	1.152	130	16.300
96	56.900	96	0.480	94	1.152	135	15.040
98	56.850	98	0.480	96	1.151	140	13.900
100	56.790	100	0.480	98	1.151	145	12.870
102	56.730	102	0.480	100	1.150	150	11.920
104	56.680	104	0.480	102	1.150	155	11.060
106	56.620	106	0.480	104	1.149	160	10.280
108	56.570	108	0.480	106	1.149	165	9.558
110	56.510	110	0.480	108	1.148	170	8.899
112	56.460	112	0.480	110	1.148	175	8.295
114	56.400	114	0.480	112	1.148	180	7.741
116	56.350	116	0.480	114	1.147	185	7.232
118	56.290	118	0.480	116	1.147	190	6.763
120	56.240	120	0.480	118	1.146	195	6.330
122	56.180	122	0.480	120	1.146	200	5.932
						205	5.564
						210	5.224

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# OILS: CLARIFIED

OCF

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Oily liquid      Colorless

Floats on water.

Keep people away.  
Avoid contact with liquid and vapor.  
Shut off ignition sources and call fire department.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Combustible.  
Extinguish with dry chemical, foam, or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

Not harmful.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33; Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** Not applicable  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 33419

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield  
3.2 **Symptoms Following Exposure:** If liquid is ingested, an increased frequency of bowel movements will occur.  
3.3 **Treatment of Exposure:** INGESTION: Do not induce vomiting; SKIN: Wipe off, wash with soap and water; EYES: Wash with water for at least 15 min.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
3–420 X 10<sup>3</sup> J/kg  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) 0.85 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) –18,000 Btu/lb = –10,000 cal/g =  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# OILS: CLARIFIED

OCF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	53.060	50	0.460	35	0.920	50	9.343
52	53.060	52	0.461	40	0.919	52	8.841
54	53.060	54	0.462	45	0.918	54	8.370
56	53.060	56	0.463	50	0.917	56	7.927
58	53.060	58	0.464	55	0.916	58	7.511
60	53.060	60	0.465	60	0.915	60	7.119
62	53.060	62	0.466	65	0.914	62	6.751
64	53.060	64	0.467	70	0.913	64	6.404
66	53.060	66	0.468	75	0.912	66	6.078
68	53.060	68	0.469	80	0.911	68	5.770
70	53.060	70	0.470	85	0.910	70	5.481
72	53.060	72	0.471	90	0.909	72	5.207
74	53.060	74	0.472	95	0.908	74	4.950
76	53.060	76	0.473	100	0.907	76	4.707
78	53.060	78	0.474	105	0.906	78	4.477
80	53.060	80	0.475	110	0.905	80	4.260
82	53.060	82	0.476	115	0.904	82	4.056
84	53.060	84	0.477	120	0.903	84	3.862
		86	0.478				
		88	0.479				
		90	0.480				
		92	0.481				
		94	0.482				
		96	0.483				
		98	0.484				
		100	0.485				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	I	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OIL, MISC: CASHEW NUT SHELL

OCN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Anacardic acid Cashew nutshell liquid Cashew nutshell oil Oil of cashew nutshell o-Pentadecadienyl salicylic acid	Liquid                      Black
<p><b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID OR VAPOR.</b>  Wear self-contained positive pressure breathing apparatus and special protective clothing.  Shut off ignition sources and call fire department.  Stay upwind out of low areas and use water spray to "knock down" vapor.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	<p>Combustible  Poisonous gases may be produced in fire or when heated.  Containers may explode in fire. (Polymerizes at high temperatures.)  Wear self-contained positive pressure breathing apparatus and special protective clothing.  Extinguish with dry chemical, carbon dioxide, water spray, fog or foam.  Combat fires from safe distance or protected location.  Cool exposed containers with water.</p>
<b>Exposure</b>	<p>CALL FOR MEDICAL AID</p> <p>VAPOR  May be harmful if inhaled.  May cause skin to blister (sensitive individuals).  May irritate eyes, nose and throat.  Move to fresh air.  If breathing has stopped, give artificial respiration.  If breathing is difficult, give oxygen.</p> <p>LIQUID  Toxic and irritating. If swallowed, cardol, a principal constituent, produces severe gastroenteritis.  Produces severe inflammation of the skin with subsequent blisters and desquamation - similar to poison ivy exposure.  May burn eyes.  Remove and isolate contaminated clothing and shoes.  Flush contaminated area with plenty of running water for at least 15 minutes.  IF IN EYES, hold eyelids open and flush with water.  IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.  Effects may be delayed; keep victim under observation.</p>
<b>Water Pollution</b>	<p>Effect of low concentrations on aquatic life is unknown.  May be dangerous if it enters water intakes.  Notify local health and wildlife officials.  Notify operators of nearby water intakes.</p>

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 4; Organic acids  
2.2 Formula: Not pertinent  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 8001-24-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 42000

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear positive pressure breathing apparatus and special protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation: May irritate mucous membranes; it is extremely acid and corrosive. Toxic; may be harmful if inhaled. Eyes: May cause burns to eyes. Skin: Produces severe inflammation of the skin with subsequent blisters and desquamation. Symptoms resemble poison ivy exposure effects. Ingestion: Toxic and irritating, Cardol, a major constituent, produces severe gastroenteritis.
- 3.3 **Treatment of Exposure:** Call emergency medical care. Inhalation: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES or SKIN: Immediately flush with running water for at least 15 minutes; hold eyelids open periodically, if appropriate. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Similar to poison ivy.  
3.11 **Liquid or Solid Characteristics:** Similar to poison ivy exposures. Produces severe inflammation of the skin followed by blisters.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: Dry chemical, carbon dioxide, water spray or foam. Large Fires: Water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** May contain irritating or poisonous gases.
- 4.6 **Behavior in Fire:** The primary constituent, anacardic acid, decarboxylates at high temperatures to produce carbon dioxide gas. This reaction could generate pressure in a heated closed container.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** data not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No restrictions on aluminum, aluminum alloys, copper, copper alloys zinc, galvanized steel or alloys having more than 10 percent zinc (by weight), lead, magnesium, silver or silver alloys, or mercury
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Variable untreated mixture. Range of main C<sub>15</sub> component phenols from six sources: anacardic acid: 74.1 to 77.4%; cardol: 15.0 to 20.1%; 2-methylcardol: 1.7 to 2.6%; cardanol: 1.2 to 9.2% Each component has four constituents because the C<sub>15</sub> side chain for each component has 0, 1, 2 and 3 double bonds.
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure vacuum valve
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Currently not available
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** Currently not available
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OIL, MISC: CASHEW NUT SHELL

OCN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# OILS, MISCELLANEOUS: CROTON

OCR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Crotonoel Croton oil Croton tiglium oil		Liquid Dark Unpleasant odor
		Floats on water.
<p><b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID.</b>  Call fire department.  Notify local health and pollution control agencies.  Protect water intakes.</p>		
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Not applicable.  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 29220

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves and any other protective clothing to prevent contact with skin.
- 3.2 **Symptoms Following Exposure:** Contact of liquid with eyes causes severe irritation. May induce severe skin irritation, inflammation, swelling, and pustule formation. Absorption through the skin may cause purging. Ingestion causes burning of the mouth and stomach and drastic purging, possibly leading to collapse and death. Small doses have a strong laxative effect.
- 3.3 **Treatment of Exposure:** EYES: flush with water; a 2.5% hydroxycortisone ointment is recommended. SKIN: remove as much liquid as possible from skin by use of a good solvent such as acetone or alcohol; wash with soap and water. INGESTION: for gastrointestinal symptoms, use demulcents; further treatment is symptomatic; do NOT induce vomiting.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> <50 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Has been used in cancer research as a promoter for other compounds that cause skin cancer.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: (3)  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Not pertinent (very high)  
9.4 **Freezing Point:** 0 to 18°F = -18 to -8°C = 255 to 265°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) 0.946 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -16,000 Btu/lb = -9,300 cal/g = -390 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, MISCELLANEOUS: CROTON

OCR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	59.870	34	0.480	35	1.158	N O T  P E R T I N E N T	
36	59.810	36	0.480	40	1.158		
38	59.760	38	0.480	45	1.158		
40	59.700	40	0.480	50	1.158		
42	59.650	42	0.480	55	1.158		
44	59.590	44	0.480	60	1.158		
46	59.540	46	0.480	65	1.158		
48	59.480	48	0.480	70	1.158		
50	59.430	50	0.480	75	1.158		
52	59.370	52	0.480	80	1.158		
54	59.310	54	0.480	85	1.158		
56	59.260	56	0.480	90	1.158		
58	59.200	58	0.480	95	1.158		
60	59.150	60	0.480	100	1.158		
62	59.090	62	0.480	105	1.158		
64	59.040	64	0.480	110	1.158		
66	58.980	66	0.480	115	1.158		
68	58.930	68	0.480	120	1.158		
70	58.870	70	0.480				
72	58.820	72	0.480				
74	58.760	74	0.480				
76	58.700	76	0.480				
78	58.650	78	0.480				
80	58.590	80	0.480				
82	58.540	82	0.480				
84	58.480	84	0.480				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# OILS, EDIBLE: COTTONSEED

OCS

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Oily liquid      Pale yellow      Odorless

Floats on water. Freezing point is 32°F.

Call fire department.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Combustible.  
Extinguish with dry chemical, foam or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

Not harmful.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 9899

## 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield.  
3.2 Symptoms Following Exposure: None; is used as a food.  
3.3 Treatment of Exposure: EYES: wash with water for at least 15 min.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: None  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: None  
3.11 Liquid or Solid Characteristics: None  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

4.1 Flash Point: 486°F C.C.  
(refined oil); 610°F C.C. (cooking oil)  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 650°F (refined oil)  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

7.1 Grades of Purity: Refined; cooking  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  
Category      Classification  
Health Hazard (Blue)..... 0  
Flammability (Red)..... 1  
Instability (Yellow)..... 0  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: 32°F = 0°C = 273°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.922 at 20°C (liquid)  
9.8 Liquid Surface Tension: 35 dynes/cm = 0.035 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) =-16,000 Btu/lb = -8,870 cal/g = -371 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.1 psia

## NOTES

# OILS, EDIBLE: COTTONSEED

OCS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	58.050	35	0.516	35	0.920	50	3909.000
52	57.980	40	0.516	40	0.919	55	3027.000
54	57.910	45	0.516	45	0.918	60	2356.000
56	57.840	50	0.516	50	0.917	65	1842.000
58	57.780	55	0.516	55	0.916	70	1448.000
60	57.710	60	0.516	60	0.915	75	1142.000
62	57.640	65	0.516	65	0.914	80	905.500
64	57.570	70	0.516	70	0.913	85	720.799
66	57.500	75	0.516	75	0.912	90	576.199
68	57.430	80	0.516	80	0.911	95	462.399
70	57.360	85	0.516	85	0.910	100	372.599
72	57.290	90	0.516	90	0.909	105	301.399
74	57.220	95	0.516	95	0.908	110	244.699
76	57.150	100	0.516	100	0.907	115	199.299
78	57.080	105	0.516	105	0.906	120	163.000
80	57.010	110	0.516	110	0.905	125	133.699
82	56.940	115	0.516	115	0.904	130	110.099
84	56.870	120	0.516	120	0.903	135	90.940
86	56.800	125	0.516				
88	56.730	130	0.516				
90	56.670	135	0.516				
92	56.600	140	0.516				
94	56.530						
96	56.460						
98	56.390						
100	56.320						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	35	0.013		N		N
	N	40	0.016		O		O
	S	45	0.018		T		T
	O	50	0.022				
	L	55	0.026		P		P
	U	60	0.030		E		E
	B	65	0.035		R		R
	L	70	0.041		T		T
	E	75	0.048		I		I
		80	0.056		N		N
		85	0.065		E		E
		90	0.075		N		N
		95	0.086		T		T
		100	0.099				
		105	0.113				
		110	0.129				
		115	0.147				
		120	0.168				

# OILS, MISCELLANEOUS: COAL TAR

OCT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Light oil	Liquid	Colorless to yellow	Pleasant odor
Floats on water. Flammable, irritating vapor is produced.			
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: 3.2/1136  
2.4 DOT ID No.: 1136  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 33521

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Protective gloves; goggles or face shield.  
3.2 Symptoms Following Exposure: Vapor causes slight irritation of nose and throat, smarting of eyes.  
Liquid may irritate skin on prolonged contact.  
3.3 Treatment of Exposure: INGESTION: have victim drink water or milk; do NOT induce vomiting.  
EYES: flush with water for at least 15 min. SKIN: wipe off and wash with soap and water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 60°-77°F C.C.  
4.2 Flammable Limits in Air: 1.3%-8%  
4.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: 4 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Various compositions, depending on type of coal used and boiling range taken.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester) or pressure-vacuum  
7.5 IMO Pollution Category: A  
7.6 Ship Type: 2  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: 223-333°F = 106-167°C = 379-440°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: (est.) 0.90 at 20°C (liquid)  
9.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.071  
9.12 Latent Heat of Vaporization: (est.) 107 Btu/lb = 59.8 cal/g = 2.5 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -17,440 Btu/lb = -9,690 cal/g = -405.7 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# OILS, MISCELLANEOUS: COAL TAR

OCT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	56.180	50	0.344	35	0.920	50	9.343
52	56.180	52	0.344	40	0.919	52	8.841
54	56.180	54	0.344	45	0.918	54	8.370
56	56.180	56	0.344	50	0.917	56	7.927
58	56.180	58	0.344	55	0.916	58	7.511
60	56.180	60	0.344	60	0.915	60	7.119
62	56.180	62	0.344	65	0.914	62	6.751
64	56.180	64	0.344	70	0.913	64	6.404
66	56.180	66	0.344	75	0.912	66	6.078
68	56.180	68	0.344	80	0.911	68	5.770
70	56.180	70	0.344	85	0.910	70	5.481
72	56.180	72	0.344	90	0.909	72	5.207
74	56.180	74	0.344	95	0.908	74	4.950
76	56.180	76	0.344	100	0.907	76	4.707
78	56.180	78	0.344	105	0.906	78	4.477
80	56.180	80	0.344	110	0.905	80	4.260
82	56.180	82	0.344	115	0.904	82	4.056
84	56.180	84	0.344	120	0.903	84	3.862
		86	0.344				
		88	0.344				
		90	0.344				
		92	0.344				
		94	0.344				
		96	0.344				
		98	0.344				
		100	0.344				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		C
	N	75	0.049		O		U
	S	80	0.057		T		R
	O	85	0.065				R
	L	90	0.076		P		E
	U	95	0.087		E		N
	B	100	0.100		R		T
	I	105	0.114		T		L
	E	110	0.131		I		Y
		115	0.149		N		
		120	0.170		E		N
		125	0.193		N		O
		130	0.218		T		T
		135	0.247				
		140	0.279				A
		145	0.314				V
		150	0.352				A
		155	0.395				I
		160	0.443				L
		165	0.495				A
		170	0.552				B
		175	0.615				L
		180	0.683				E
		185	0.758				
		190	0.841				
		195	0.930				

# OCTYL DECYL PHTHALATE

ODP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Octyl-n-decyl phthalate	Liquid	Colorless	Mild, characteristic odor
Floats on water.			
Wear goggles, self-contained breathing apparatus, and rubber overclothing. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{18}H_{34}(COOC_8H_{17})(COOC_{10}H_{21})$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 119-07-3  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 45$  g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 455°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 164.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 47.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 418.68  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:**  $-40^{\circ}\text{F} = -40^{\circ}\text{C} = 233^{\circ}\text{K}$   
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.972 - 0.976  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OCTYL DECYL PHTHALATE

ODP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# OILS: DIESEL

ODS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Fuel oil 1-D Fuel oil 2-D	Oily liquid  Yellow-brown  Lube or fuel oil odor  Floats on water.
Keep people away. Avoid contact with liquid, shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: 3.1/1270  
2.4 DOT ID No.: 1993  
2.5 CAS Registry No.: 68334-30-5  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 33440

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield.  
3.2 Symptoms Following Exposure: If liquid is ingested, an increased frequency of bowel movements will occur.  
3.3 Treatment of Exposure: INGESTION: do NOT induce vomiting. SKIN: wipe off, wash with soap and water. EYES: wash with copious amounts of water for at least 15 min.  
3.4 TLV-TWA: Notice of intended change: 100 mg/m<sup>3</sup> (skin)  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: (1-D) 100°F C.C.; (2-D) 125°F C.C.  
4.2 Flammable Limits in Air: 1.3-6.0 vol.%  
4.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: (1-D) 350-625°F (2-D) 490-545°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: 4 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 204 mg/l/24 hr/juvenile American shad/TL<sub>50</sub>/salt water  
6.2 Waterfowl Toxicity: >20 ml/kg /LD<sub>50</sub>/mallards  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Diesel Fuel 1-D (ASTM); Diesel Fuel 2-D (ASTM)  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: 550-640°F = 288-338°C = 561-612°K  
9.4 Freezing Point: -30 to 0°F = -34 to -18°C = 239 to 255°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.841 at 16°C (liquid)  
9.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: -18,400 Btu/lb = -10,200 cal/g = 429 X 10<sup>6</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Varies

### NOTES

# OILS: DIESEL

ODS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	52.430	10	0.429	30	0.968	100	11.950
52	52.430	15	0.431	35	0.966		
54	52.430	20	0.434	40	0.965		
56	52.430	25	0.436	45	0.963		
58	52.430	30	0.439	50	0.962		
60	52.430	35	0.441	55	0.961		
62	52.430	40	0.444	60	0.959		
64	52.430	45	0.446	65	0.958		
66	52.430	50	0.448	70	0.957		
68	52.430	55	0.451	75	0.955		
70	52.430	60	0.453	80	0.954		
72	52.430	65	0.456	85	0.952		
74	52.430	70	0.458	90	0.951		
76	52.430	75	0.461	95	0.950		
78	52.430	80	0.463	100	0.948		
80	52.430	85	0.466	105	0.947		
82	52.430	90	0.468	110	0.946		
84	52.430	95	0.471	115	0.944		
		100	0.473	120	0.943		
		105	0.475	125	0.941		
				130	0.940		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				



# OCTYL EPOXY TALLATE

OET

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Epoxidized tall oil, octyl ester	Liquid	Pale yellow	Mild odor
Floats on water.			
Keep people away. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula: Mixture  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51615

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Chemical goggles; face shield; oil-resistant gloves  
3.2 **Symptoms Following Exposure:** Contact with eyes causes mild inflammation. Contact with skin may produce allergic response.  
3.3 **Treatment of Exposure:** EYES or SKIN: remove excess oil with cloth or absorbent paper; then wash with soapy water and flush with clear water; consult a physician.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> >15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 450°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May attack some forms of plastics.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: 0  
Human Contact hazard: -  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 420 (approx.)  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) 1.002 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 40.1 dynes/cm = 0.0401 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OCTYL EPOXY TALLATE

OET

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	58.550		N O T		N O T	77	35.000
54	58.480						
56	58.410						
58	58.340						
60	58.270		P		P		
62	58.200		E		E		
64	58.130		R		R		
66	58.060		T		T		
68	57.990		I		I		
70	57.920		N		N		
72	57.850		E		E		
74	57.780		N		N		
76	57.710		E		E		
78	57.640		N		N		
80	57.570						
82	57.500						
84	57.440						
86	57.370						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T		N O T		N O T
			P		P		P
			E		E		E
			R		R		R
			T		T		T
			I		I		I
			N		N		N
			E		E		E
			N		N		N

# OILS, FUEL: 4

OFR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> No. 4 Residual fuel oil		Oily liquid  Dark  Lube or fuel oil odor
		Floats on water.
Keep people away. Avoid contact with liquid. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn;  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 33;  
 Miscellaneous Hydrocarbon Mixtures  
 2.2 Formula: Not applicable  
 2.3 IMO/UN Designation: 3.3/1223  
 2.4 DOT ID No.: 1993  
 2.5 CAS Registry No.: Currently not available  
 2.6 NAERG Guide No.: 128  
 2.7 Standard Industrial Trade Classification: 33440

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
 3.2 **Symptoms Following Exposure:** INGESTION: gastrointestinal irritation. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure.  
 3.3 **Treatment of Exposure:** INGESTION: do NOT lavage or induce vomiting. ASPIRATION: treatment probably not required; delayed development of pulmonary irritation can be detected by serial chest x-rays; consider prophylactic antibiotic regime if condition warrants. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.  
 3.4 **TLV-TWA:** Notice of intended change: Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** None  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** >130°F C.C.  
 4.2 **Flammable Limits in Air:** 1.0%-5%  
 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 505°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 4 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid  
 8.2 49 CFR Class: 3  
 8.3 49 CFR Package Group: III  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
 9.2 Molecular Weight: Not pertinent  
 9.3 Boiling Point at 1 atm: 214 to >1092°F = 101 to >588°C = 374 to 861°K  
 9.4 Freezing Point: -20 to +15°F = -29 to -9°C = 244 to 264°K  
 9.5 Critical Temperature: Not pertinent  
 9.6 Critical Pressure: Not pertinent  
 9.7 Specific Gravity: 0.904 at 15°C (liquid)  
 9.8 Liquid Surface Tension: Currently not available  
 9.9 Liquid Water Interfacial Tension: Currently not available  
 9.10 Vapor (Gas) Specific Gravity: Not pertinent  
 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
 9.12 Latent Heat of Vaporization: Not pertinent  
 9.13 Heat of Combustion: -17,460 Btu/lb = -9,700 cal/g = -406.1 X 10<sup>3</sup> J/kg  
 9.14 Heat of Decomposition: Not pertinent  
 9.15 Heat of Solution: Not pertinent  
 9.16 Heat of Polymerization: Not pertinent  
 9.17 Heat of Fusion: Currently not available  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# OILS, FUEL: 4

OFR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	56.180	50	0.460	35	0.908	100	14.500
52	56.180	52	0.461	40	0.908		
54	56.180	54	0.462	45	0.908		
56	56.180	56	0.463	50	0.908		
58	56.180	58	0.464	55	0.908		
60	56.180	60	0.465	60	0.908		
62	56.180	62	0.466	65	0.908		
64	56.180	64	0.467	70	0.908		
66	56.180	66	0.468	75	0.908		
68	56.180	68	0.469	80	0.908		
70	56.180	70	0.470	85	0.908		
72	56.180	72	0.471	90	0.908		
74	56.180	74	0.472	95	0.908		
76	56.180	76	0.473	100	0.908		
78	56.180	78	0.474	105	0.908		
80	56.180	80	0.475	110	0.908		
82	56.180	82	0.476	115	0.908		
84	56.180	84	0.477	120	0.908		
		86	0.478	125	0.908		
		88	0.479				
		90	0.480				
		92	0.481				
		94	0.482				
		96	0.483				
		98	0.484				
		100	0.485				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OILS, EDIBLE: FISH

OFS

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Oily liquid      Pale yellow      Fishy odor

Floats on water.

Call fire department.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Combustible.  
Extinguish with dry chemical, foam or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

Not harmful.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula: Not applicable  
2.3 IMO/IUN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification:  
41110

## 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield.  
3.2 Symptoms Following Exposure: None-is a food.  
3.3 Treatment of Exposure: EYES: flush with water for at least 15 min.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: None  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: None  
3.11 Liquid or Solid Characteristics: None  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

4.1 Flash Point: 420°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.93 at 20°C (liquid)  
9.8 Liquid Surface Tension: 38 dynes/cm = 0.038 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -16,000 Btu/lb = -8,870 cal/g = -371 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# OILS, EDIBLE: FISH

OFS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	58.680	35	0.478	35	0.920	50	3909.000
52	58.610	40	0.478	40	0.919	55	3027.000
54	58.540	45	0.478	45	0.918	60	2356.000
56	58.470	50	0.478	50	0.917	65	1842.000
58	58.400	55	0.478	55	0.916	70	1448.000
60	58.330	60	0.478	60	0.915	75	1142.000
62	58.260	65	0.478	65	0.914	80	905.500
64	58.190	70	0.478	70	0.913	85	720.799
66	58.120	75	0.478	75	0.912	90	576.199
68	58.050	80	0.478	80	0.911	95	462.399
70	57.980	85	0.478	85	0.910	100	372.599
72	57.910	90	0.478	90	0.909	105	301.399
74	57.840	95	0.478	95	0.908	110	244.699
76	57.780	100	0.478	100	0.907	115	199.299
78	57.710			105	0.906	120	163.000
80	57.640			110	0.905	125	133.699
82	57.570			115	0.904	130	110.099
84	57.500			120	0.903	135	90.940
86	57.430						
88	57.360						
90	57.290						
92	57.220						
94	57.150						
96	57.080						
98	57.010						
100	56.940						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	35	0.013		N		N
	N	40	0.016		O		O
	S	45	0.018		T		T
	O	50	0.022				
	L	55	0.026		P		P
	U	60	0.030		E		E
	B	65	0.035		R		R
	L	70	0.041		T		T
	E	75	0.048		I		I
		80	0.056		N		N
		85	0.065		E		E
		90	0.075		N		N
		95	0.086		T		T
		100	0.099				
		105	0.113				
		110	0.129				
		115	0.147				
		120	0.168				

# OILS, FUEL: 5

OFV

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> No. 5 Residual fuel oil	Oily liquid  Dark  Strong lube oil odor  Usually floats on water.
Keep people away. Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: 3.3/1223  
2.4 DOT ID No.: 1993  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 33440

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** INGESTION: gastrointestinal irritation. ASPIRATION: treatment probably not required; delayed development of pulmonary irritation can be detected by serial chest x-rays; consider prophylactic antibiotic regime if condition warrants. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.  
3.3 **Treatment of Exposure:** Currently not available  
3.4 **TLV-TWA:** Notice of intended change: Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** None  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** >130°F C.C.  
4.2 **Flammable Limits in Air:** 1%-5%  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Fuel oil No. 5 (heavy); Fuel oil No. 5 (light)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 426-->1062°F = 218-->570°C = 491-->843°K  
9.4 **Freezing Point:** 0°F = -18°C = 255°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.936 at 16°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -18,000 Btu/lb = -10,000 cal/g = -418.68 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, FUEL: 5

OFV

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	58.360	50	0.460	40	0.873	100	43.500
52	58.360	52	0.461	45	0.873		
54	58.360	54	0.462	50	0.873		
56	58.360	56	0.463	55	0.873		
58	58.360	58	0.464	60	0.873		
60	58.360	60	0.465	65	0.873		
62	58.360	62	0.466	70	0.873		
64	58.360	64	0.467	75	0.873		
66	58.360	66	0.468	80	0.873		
68	58.360	68	0.469	85	0.873		
70	58.360	70	0.470	90	0.873		
72	58.360	72	0.471	95	0.873		
74	58.360	74	0.472	100	0.873		
76	58.360	76	0.473	105	0.873		
78	58.360	78	0.474				
80	58.360	80	0.475				
82	58.360	82	0.476				
84	58.360	84	0.477				
		86	0.478				
		88	0.479				
		90	0.480				
		92	0.481				
		94	0.482				
		96	0.483				
		98	0.484				
		100	0.485				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				



# OILS: CRUDE

OIL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Petroleum		Oily liquid      Dark      Acid odor
		Floats on water. Flammable vapor may be produced.
Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Not irritating to eyes, nose, or throat.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn;  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 33;  
 Miscellaneous Hydrocarbon Mixtures  
**2.2 Formula:** Not applicable  
**2.3 IMO/UN Designation:** 3.1/1267  
**2.4 DOT ID No.:** 1267  
**2.5 CAS Registry No.:** Currently not available  
**2.6 NAERG Guide No.:** 128  
**2.7 Standard Industrial Trade Classification:** 33300

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Goggles or face shield; rubber gloves and boots.  
**3.2 Symptoms Following Exposure:** May irritate eyes and skin.  
**3.3 Treatment of Exposure:** EYES: flush with water for at least 15 min. SKIN: wipe off and wash with soap and water.  
**3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Currently not available  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 20-90°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Not pertinent  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** 4 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent.  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
 3 ppm\*/fresh water fish/toxic/fresh water  
 200 ppm/24 hr/corals: porites/20-90% normal response/salt water  
 \*Time period not specified.  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Wide variety, depending on oil field where produced.  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester)  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid  
**8.2 49 CFR Class:** 3  
**8.3 49 CFR Package Group:** I  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** Not pertinent  
**9.3 Boiling Point at 1 atm:** 90-->750°F = 32-->400°C = 305-->673°K  
**9.4 Freezing Point:** Not pertinent  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 0.70 - 0.98 at 15°C (liquid)  
**9.8 Liquid Surface Tension:** 24-38 dynes/cm = 0.024-0.038 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
**9.12 Latent Heat of Vaporization:** 140-150 Btu/lb = 76-86 cal/g = 3.2-3.6 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -18,252 Btu/lb = -10,140 cal/g = -424.54 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 0.10 psia

### NOTES

# OILS: CRUDE

OIL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	43.700	50	0.460	35	0.920	50	9.343
52	43.700	52	0.461	40	0.919	52	8.841
54	43.700	54	0.462	45	0.918	54	8.370
56	43.700	56	0.463	50	0.917	56	7.927
58	43.700	58	0.464	55	0.916	58	7.511
60	43.700	60	0.465	60	0.915	60	7.119
62	43.700	62	0.466	65	0.914	62	6.751
64	43.700	64	0.467	70	0.913	64	6.404
66	43.700	66	0.468	75	0.912	66	6.078
68	43.700	68	0.469	80	0.911	68	5.770
70	43.700	70	0.470	85	0.910	70	5.481
72	43.700	72	0.471	90	0.909	72	5.207
74	43.700	74	0.472			74	4.950
76	43.700	76	0.473			76	4.707
78	43.700	78	0.474			78	4.477
80	43.700	80	0.475			80	4.260
82	43.700	82	0.476			82	4.056
84	43.700	84	0.477			84	3.862
		86	0.478				
		88	0.479				
		90	0.480				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	E	105	0.114		T		T
		110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OLEIC ACID

OLA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> cis-8-Heptadecylenecarboxylic acid cis-9-Octadecenoic acid Red oil	Liquid  Floats on water.	Colorless to pale yellow	Mild odor
Keep people away. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemicals or carbon dioxide. Water or foam may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Chemical and Physical Treatment: Absorb Clean shore line Salvage waterfowl	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$ 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 112-80-1 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51378
<b>3. HEALTH HAZARDS</b> 3.1 Personal Protective Equipment: Impervious gloves; goggles or face shield; impervious apron 3.2 Symptoms Following Exposure: Industrial use of compound involves no known hazards. Ingestion causes mild irritation of mouth and stomach. Contact with eyes or skin causes mild irritation. 3.3 Treatment of Exposure: INGESTION: give large amount of water. EYES: if eye irritation occurs, flush with water and get medical attention. SKIN: wash thoroughly with soap and water. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 1; $\text{LD}_{50} >15 \text{ g/kg}$ 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 390–425°F O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 685°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 121.4 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 35.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 79-83%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 277 (avg.)  
9.3 Boiling Point at 1 atm: 432°F = 222°C = 495°K  
9.4 Freezing Point: 57°F = 14°C = 287°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.89 at 25°C (liquid)  
9.8 Liquid Surface Tension: 32.8 dynes/cm = 0.0328 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: 15.59 dynes/cm = 0.01559 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: 103 Btu/lb = 57 cal/g = 2.4 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# OLEIC ACID

OLA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	56.000	60	0.486	80	1.553	70	37.070
62	55.950	61	0.488	90	1.543	75	33.530
64	55.900	62	0.491	100	1.533	80	30.380
66	55.850	63	0.493	110	1.523	85	27.580
68	55.810	64	0.495	120	1.513	90	25.080
70	55.760	65	0.498	130	1.503	95	22.850
72	55.710	66	0.500	140	1.493	100	20.850
74	55.660	67	0.503	150	1.483	105	19.050
76	55.610	68	0.505	160	1.473	110	17.440
78	55.560	69	0.507	170	1.463	115	15.990
80	55.510	70	0.510	180	1.453	120	14.680
82	55.470	71	0.512	190	1.443	125	13.500
84	55.420	72	0.514	200	1.433	130	12.430
86	55.370	73	0.517	210	1.423	135	11.460
88	55.320	74	0.519	220	1.413	140	10.580
90	55.270	75	0.522	230	1.403	145	9.785
92	55.220	76	0.524	240	1.393	150	9.058
94	55.170	77	0.526	250	1.383	155	8.396
96	55.130	78	0.529	260	1.373	160	7.792
98	55.080	79	0.531	270	1.363	165	7.240
100	55.030	80	0.534	280	1.353	170	6.735
102	54.980	81	0.536	290	1.343	175	6.272
104	54.930	82	0.538			180	5.848
		83	0.541			185	5.458
		84	0.543			190	5.100
		85	0.546			195	4.770

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# OILS, MISCELLANEOUS: LUBRICATING

OLB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Crankcase oil Motor oil Transmission oil	Oily liquid      Yellow-brown      Lube oil odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment:  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 33;  
 Miscellaneous Hydrocarbon Mixtures  
 2.2 **Formula:** Not applicable  
 2.3 **IMO/UN Designation:** 3.3/1270  
 2.4 **DOT ID No.:** 1268  
 2.5 **CAS Registry No.:** Currently not available  
 2.6 **NAERG Guide No.:** 128  
 2.7 **Standard Industrial Trade Classification:**  
 33450

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
 3.2 **Symptoms Following Exposure:** INGESTION: minimal gastrointestinal tract irritation; increased frequency of bowel passage may occur. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure.  
 3.3 **Treatment of Exposure:** INGESTION: do NOT lavage or induce vomiting. ASPIRATION: treatment probably not required; delayed development of pulmonary irritation can be detected by serial chest x-rays. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 300°F C.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water of foam may cause frothing.  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 500°F-700°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 4 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
 Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):**  
 Currently not available  
 6.4 **Food Chain Concentration Potential:**  
 None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Various viscosities  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** III  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** Not pertinent  
 9.3 **Boiling Point at 1 atm:** Very high  
 9.4 **Freezing Point:** Not pertinent  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** (est.) 0.902 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 36-37.5 dynes/cm = 0.036-0.0375 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** 33-54 dynes/cm = 0.033-0.054 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
 Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** -18,486 Btu/lb = -10,270 cal/g = -429.98 X 10<sup>3</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, MISCELLANEOUS: LUBRICATING

OLB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	56.180	50	0.460	35	0.920	100	275.000
52	56.180	52	0.461	40	0.919		
54	56.180	54	0.462	45	0.918		
56	56.180	56	0.463	50	0.917		
58	56.180	58	0.464	55	0.916		
60	56.180	60	0.465	60	0.915		
62	56.180	62	0.466	65	0.914		
64	56.180	64	0.467	70	0.913		
66	56.180	66	0.468	75	0.912		
68	56.180	68	0.469	80	0.911		
70	56.180	70	0.470	85	0.910		
72	56.180	72	0.471	90	0.909		
74	56.180	74	0.472	95	0.908		
76	56.180	76	0.473	100	0.907		
78	56.180	78	0.474	105	0.906		
80	56.180	80	0.475	110	0.905		
82	56.180	82	0.476	115	0.904		
84	56.180	84	0.477	120	0.903		
		86	0.478				
		88	0.479				
		90	0.480				
		92	0.481				
		94	0.482				
		96	0.483				
		98	0.484				
		100	0.485				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OILS, EDIBLE: LARD

OLD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Kettle rendered lard Lard Leaf lard Prime steam lard	Liquid or solid  Colorless to Light yellow  Fatty odor  Floats on water.
Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	LIQUID OR SOLID Not harmful. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 41120

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Substance is essentially nontoxic. Prolonged contact with skin may cause dermatitis (oil acne). Hot liquid can burn eyes or skin.  
3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min.; get medical attention for burn. SKIN: wipe off; get medical attention for burn. INGESTION: do NOT induce vomiting.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 395°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing; water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 833°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Various grades, depending on source of animal fat used and method of rendering  
7.2 **Storage Temperature:** Ambient, or elevated (for liquid)  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** 66–99°F = 19–37°C = 292–310°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.861 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 30°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 30°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** –16,750 Btu/lb = –9,320 cal/g = –390 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

NOTES

# OILS, EDIBLE: LARD

OLD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
88	53.380	88	0.480	66	1.158		N O T  P E R T I N E N T
90	53.320	90	0.480	68	1.157		
92	53.270	92	0.480	70	1.157		
94	53.210	94	0.480	72	1.156		
96	53.160	96	0.480	74	1.156		
98	53.100	98	0.480	76	1.156		
100	53.040	100	0.480	78	1.155		
102	52.990	102	0.480	80	1.155		
104	52.930	104	0.480	82	1.154		
106	52.880	106	0.480	84	1.154		
108	52.820	108	0.480	86	1.153		
110	52.770	110	0.480	88	1.153		
112	52.710	112	0.480	90	1.152		
114	52.660	114	0.480	92	1.152		
116	52.600	116	0.480	94	1.152		
118	52.550	118	0.480	96	1.151		
120	52.490	120	0.480	98	1.151		
122	52.430	122	0.480	100	1.150		
				102	1.150		
				104	1.149		
				106	1.149		
				108	1.148		
				110	1.148		
				112	1.148		
				114	1.147		
				116	1.147		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



## OLEUM

OLM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Fuming sulfuric acid	Oily liquid	Colorless to cloudy	Sharp, choking odor
Mixes and reacts with water producing heat. Irritating mist is produced.			
<b>Evacuate.</b> <b>Keep people away. AVOID CONTACT WITH LIQUID AND MIST.</b> <b>Wear chemical protective suit with self-contained breathing apparatus.</b> <b>Stay upwind and use water spray to "knock down" mist.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. Flammable gas may be produced on contact with metals. Wear chemical protective suit with self-contained breathing apparatus. DO NOT USE WATER ON ADJACENT FIRES.		
<b>Exposure</b>	CALL FOR MEDICAL AID. MIST Irritating to eyes, nose and throat. If inhaled, will cause coughing or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration (but NOT mouth to mouth). If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 0; Unassigned cargoes  
2.2 Formula:  $\text{SO}_3\text{-H}_2\text{SO}_4$   
2.3 IMO/UN Designation: 8.0/1831  
2.4 DOT ID No.: 1831  
2.5 CAS Registry No.: 8014-95-7  
2.6 NAERG Guide No.: 137  
2.7 Standard Industrial Trade Classification: 52232

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respirator approved for acid mists; rubber gloves; splashproof goggles; eyewash fountain and safety shower; rubber footwear; face shield.  
3.2 **Symptoms Following Exposure:** Acid mist is irritating to eyes, nose and throat. Liquid causes severe burns of skin and eyes.  
3.3 **Treatment of Exposure:** INGESTION: have victim drink water or milk; do NOT induce vomiting. EYES: flush with plenty of water for at least 15 min.; call a doctor. SKIN: flush with plenty of water.  
3.4 TLV-TWA: 1 mg/m<sup>3</sup>  
3.5 TLV-STEL: 3 mg/m<sup>3</sup>  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Severe burns of mouth and stomach.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact; very injurious to the eyes.  
3.12 **Odor Threshold:** 1 mg/m<sup>3</sup>  
3.13 **IDLH Value:** 15 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 1 mg/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Avoid use of water on adjacent fires.  
4.5 **Special Hazards of Combustion**  
Products: Toxic and irritating vapors are generated.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Vigorous reaction with water; spatters.  
5.2 **Reactivity with Common Materials:** May react with cast iron with explosive violence. Attacks many metals, releasing flammable hydrogen gas. Capable of igniting finely divided combustible material on contact. Extremely hazardous in contact with many materials.  
5.3 **Stability During Transport:** Normally stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Cautious dilution with water, with protection against violent spattering. Diluted acid may be neutralized with lime or soda ash.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
24 ppm/24 hr/bluegill/lethal/fresh water  
42 ppm/48 hr/prawn/LC<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 20% (104.5% sulfuric acid) to 65% (114.6% sulfuric acid)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	2

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.91–1.97 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

## NOTES

# OLEUM

OLM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
59	119.200	68	0.330		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# OILS, MISCELLANEOUS: LINSEED

OLS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Flaxseed oil Linseed oil Raw linseed oil	Liquid  Light yellow to dark yellow  Paint-like odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	LIQUID Not harmful. Do not induce vomiting.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous hydrocarbon mixture  
2.2 **Formula:** Not applicable  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 9899

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Contact of liquid with eyes causes mild irritation. Prolonged contact with skin can cause dermatitis. Ingestion of large doses (over 1 oz) has laxative effect.  
3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min. SKIN: wipe off; wash with soap and water. INGESTION: do NOT induce vomiting.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> >15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Liver damage in rats (from addition of oil to diet)  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 535°F O.C. 403°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing; water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 650°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Raw grade; varnish grade; grinding grade; heat-bodied grade; blown grade  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Not pertinent (very high)  
9.4 **Freezing Point:** -2°F = -19°C = 254°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.932 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -16,800 Btu/lb = -9,300 cal/g = -390 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

NOTES

# OILS, MISCELLANEOUS: LINSEED

OLS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	59.250	65	0.456	35	1.158	60	56.030
36	59.190	70	0.458	40	1.158	61	54.880
38	59.130	75	0.459	45	1.158	62	53.760
40	59.080	80	0.461	50	1.158	63	52.660
42	59.020	85	0.463	55	1.158	64	51.590
44	58.970	90	0.465	60	1.158	65	50.550
46	58.910	95	0.466	65	1.158	66	49.530
48	58.860	100	0.468	70	1.158	67	48.530
50	58.800	105	0.470	75	1.158	68	47.560
52	58.750	110	0.471	80	1.158	69	46.620
54	58.690	115	0.473	85	1.158	70	45.690
56	58.640	120	0.475	90	1.158	71	44.790
58	58.580	125	0.477	95	1.158	72	43.900
60	58.520	130	0.478	100	1.158	73	43.040
62	58.470	135	0.480	105	1.158	74	42.200
64	58.410	140	0.482	110	1.158	75	41.380
66	58.360	145	0.484	115	1.158	76	40.570
68	58.300	150	0.485	120	1.158	77	39.790
70	58.250	155	0.487				
72	58.190	160	0.489				
74	58.140	165	0.491				
76	58.080	170	0.492				
78	58.020						
80	57.970						
82	57.910						
84	57.860						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# OILS, MISCELLANEOUS: MINERAL

OMN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Liquid petrolatum White oil	Oily liquid      Colorless      Odorless  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment:  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 33;  
 Miscellaneous Hydrocarbon Mixtures  
 2.2 **Formula:** Not applicable  
 2.3 **IMO/UN Designation:** 3.3/1270  
 2.4 **DOT ID No.:** Not listed.  
 2.5 **CAS Registry No.:** Currently not available  
 2.6 **NAERG Guide No.:** Not listed.  
 2.7 **Standard Industrial Trade Classification:**  
 33429

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield.  
 3.2 **Symptoms Following Exposure:** Ingestion of liquid can cause very loose bowel movements.  
 3.3 **Treatment of Exposure:** EYES: wash with water.  
 3.4 **TLV-TWA:** 5 mg/m<sup>3</sup> (mist)  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None  
 3.10 **Vapor (Gas) Irritant Characteristics:** None  
 3.11 **Liquid or Solid Characteristics:** None  
 3.12 **Odor Threshold:** Odorless  
 3.13 **IDLH Value:** 2,500 mg/m<sup>3</sup>  
 3.14 **OSHA PEL-TWA:** 5 mg/m<sup>3</sup>  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 380°F O.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 500–700°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 4 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
 Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):**  
 Currently not available  
 6.4 **Food Chain Concentration Potential:**  
 None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial; refined  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** Not pertinent  
 9.3 **Boiling Point at 1 atm:** Very high  
 9.4 **Freezing Point:** Not pertinent  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.822 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 27 dynes/cm = 0.027 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** 47 dynes/cm = 0.047 N/m at 70°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
 Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** Currently not available  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, MISCELLANEOUS: MINERAL

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	51.190	65	0.487	65	0.907	100	38.000
52	51.190	70	0.487	70	0.905		
54	51.190	75	0.487	75	0.903		
56	51.190	80	0.487	80	0.901		
58	51.190	85	0.487	85	0.898		
60	51.190	90	0.487	90	0.896		
62	51.190	95	0.487	95	0.894		
64	51.190	100	0.487	100	0.892		
66	51.190	105	0.487	105	0.889		
68	51.190	110	0.487	110	0.887		
70	51.190	115	0.487	115	0.885		
72	51.190	120	0.487	120	0.883		
74	51.190	125	0.487	125	0.880		
76	51.190	130	0.487	130	0.878		
78	51.190	135	0.487	135	0.876		
80	51.190	140	0.487	140	0.874		
82	51.190	145	0.487	145	0.871		
84	51.190	150	0.487	150	0.869		
		155	0.487	155	0.867		
		160	0.487	160	0.865		
		165	0.487	165	0.862		
		170	0.487	170	0.860		
		175	0.487	175	0.858		
		180	0.487	180	0.856		
		185	0.487	185	0.853		
		190	0.487				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OILS, MISCELLANEOUS: MINERAL SEAL

OMS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Long-time burning oil Mineral colza oil 300o Oil Signal oil	Oily liquid  Colorless to yellow  Kerosene odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Chemical and Physical Treatment: Burn Salvage waterfowl	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 33; Miscellaneous Hydrocarbon Mixtures <b>2.2 Formula:</b> Not listed <b>2.3 IMO/UN Designation:</b> 3.3/1270 <b>2.4 DOT ID No.:</b> Not listed. <b>2.5 CAS Registry No.:</b> Currently not available <b>2.6 NAERG Guide No.:</b> Not listed. <b>2.7 Standard Industrial Trade Classification:</b> 33429
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Protective gloves; goggles or face shield. <b>3.2 Symptoms Following Exposure:</b> Vapors cause slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs causes coughing, distress, and rapidly developing pulmonary edema. <b>3.3 Treatment of Exposure:</b> ASPIRATION: enforced bed rest; administer oxygen; call a doctor. INGESTION: do NOT induce vomiting; have victim drink water or milk. EYES: wash with copious amounts of water. SKIN: wipe off, wash with soap and water. <b>3.4 TLV-TWA:</b> 5 mg/m <sup>3</sup> <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. <b>3.12 Odor Threshold:</b> 1 ppm <b>3.13 IDLH Value:</b> 2,500 mg/m <sup>3</sup> <b>3.14 OSHA PEL-TWA:</b> 5 mg/m <sup>3</sup> <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:**  
170-275°F O.C.
- 4.2 Flammable Limits in Air:** Currently not available
- 4.3 Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 Special Hazards of Combustion Products:** Not pertinent
- 4.6 Behavior in Fire:** Not pertinent
- 4.7 Auto Ignition Temperature:** Currently not available
- 4.8 Electrical Hazards:** Not pertinent
- 4.9 Burning Rate:** 4 mm/min.
- 4.10 Adiabatic Flame Temperature:** Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 Flame Temperature:** Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction
- 5.2 Reactivity with Common Materials:** No reaction
- 5.3 Stability During Transport:** Stable
- 5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 Polymerization:** Not pertinent
- 5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
Currently not available
- 6.2 Waterfowl Toxicity:** Currently not available
- 6.3 Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 Food Chain Concentration Potential:**  
None
- 6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Several grades of varying pour points, all highly refined.
- 7.2 Storage Temperature:** Ambient
- 7.3 Inert Atmosphere:** No requirement
- 7.4 Venting:** Open (flame arrester)
- 7.5 IMO Pollution Category:** Currently not available
- 7.6 Ship Type:** Currently not available
- 7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed
- 8.2 49 CFR Class:** Not pertinent
- 8.3 49 CFR Package Group:** Not listed.
- 8.4 Marine Pollutant:** No
- 8.5 NFPA Hazard Classification:** Not listed
- 8.6 EPA Reportable Quantity:** Not listed.
- 8.7 EPA Pollution Category:** Not listed.
- 8.8 RCRA Waste Number:** Not listed
- 8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid
- 9.2 Molecular Weight:** Not pertinent
- 9.3 Boiling Point at 1 atm:** >500°F = >260°C = >533°K
- 9.4 Freezing Point:** 10.0°F = -12.2°C = 261.0°K
- 9.5 Critical Temperature:** Not pertinent
- 9.6 Critical Pressure:** Not pertinent
- 9.7 Specific Gravity:** 0.811-0.825 at 15°C (liquid)
- 9.8 Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension:** 47-50 dynes/cm = 0.047-0.050 N/m at 20°C
- 9.10 Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 Latent Heat of Vaporization:** Not pertinent
- 9.13 Heat of Combustion:** (est.) -18,000 Btu/lb = -10,000 cal/g = -420 X 10<sup>5</sup> J/kg
- 9.14 Heat of Decomposition:** Not pertinent
- 9.15 Heat of Solution:** Not pertinent
- 9.16 Heat of Polymerization:** Not pertinent
- 9.17 Heat of Fusion:** Currently not available
- 9.18 Limiting Value:** Currently not available
- 9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# OILS, MISCELLANEOUS: MINERAL SEAL

OMS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	50.620	50	0.460	35	0.920	50	9.343
52	50.620	52	0.461	40	0.919	52	8.841
54	50.620	54	0.462	45	0.918	54	8.370
56	50.620	56	0.463	50	0.917	56	7.927
58	50.620	58	0.464	55	0.916	58	7.511
60	50.620	60	0.465	60	0.915	60	7.119
62	50.620	62	0.466	65	0.914	62	6.751
64	50.620	64	0.467	70	0.913	64	6.404
66	50.620	66	0.468	75	0.912	66	6.078
68	50.620	68	0.469	80	0.911	68	5.770
70	50.620	70	0.470	85	0.910	70	5.481
72	50.620	72	0.471	90	0.909	72	5.207
74	50.620	74	0.472	95	0.908	74	4.950
76	50.620	76	0.473	100	0.907	76	4.707
78	50.620	78	0.474	105	0.906	78	4.477
80	50.620	80	0.475	110	0.905	80	4.260
82	50.620	82	0.476	115	0.904	82	4.056
84	50.620	84	0.477	120	0.903	84	3.862
		86	0.478				
		88	0.479				
		90	0.480				
		92	0.481				
		94	0.482				
		96	0.483				
		98	0.484				
		100	0.485				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	I	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				



# OILS, MISCELLANEOUS: MOTOR

OMT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Crankcase oil Lubricating oil Transmission oil	Oily liquid      Yellow-brown      Lube oil odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment:  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 33;  
 Miscellaneous Hydrocarbon Mixtures  
 2.2 **Formula:** Not applicable  
 2.3 **IMO/UN Designation:** 3.3/1270  
 2.4 **DOT ID No.:** 1270  
 2.5 **CAS Registry No.:** Currently not available  
 2.6 **NAERG Guide No.:** 128  
 2.7 **Standard Industrial Trade Classification:**  
 33450

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
 3.2 **Symptoms Following Exposure:** INGESTION: minimal gastrointestinal irritation; increased frequency of bowel passage may occur. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure.  
 3.3 **Treatment of Exposure:** INGESTION: do NOT lavage or induce vomiting. ASPIRATION: treatment probably not required; delayed development of pulmonary irritation can be detected by serial chest x-rays. EYES: wash with copious amounts of water. SKIN: wipe off oil and wash with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
 275–600°F C.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 325–625°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 4 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
 Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):**  
 Currently not available  
 6.4 **Food Chain Concentration Potential:**  
 None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Various viscosities  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** III  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** Not pertinent  
 9.3 **Boiling Point at 1 atm:** Very high  
 9.4 **Freezing Point:** –29.9°F = –34.4°C = 238.8°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.84–0.96 at 15°C (liquid)  
 9.8 **Liquid Surface Tension:** 36–37.5 dynes/cm = 0.036–0.0375 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** 33–54 dynes/cm = 0.033–0.054 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
 Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** –18,486 Btu/lb = –10,270 cal/g = –429.98 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, MISCELLANEOUS: MOTOR

OMT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	52.430	50	0.460	35	0.920	100	275.000
52	52.430	52	0.461	40	0.919		
54	52.430	54	0.462	45	0.918		
56	52.430	56	0.463	50	0.917		
58	52.430	58	0.464	55	0.916		
60	52.430	60	0.465	60	0.915		
62	52.430	62	0.466	65	0.914		
64	52.430	64	0.467	70	0.913		
66	52.430	66	0.468	75	0.912		
68	52.430	68	0.469	80	0.911		
70	52.430	70	0.470	85	0.910		
72	52.430	72	0.471	90	0.909		
74	52.430	74	0.472	95	0.908		
76	52.430	76	0.473	100	0.907		
78	52.430	78	0.474	105	0.906		
80	52.430	80	0.475	110	0.905		
82	52.430	82	0.476	115	0.904		
84	52.430	84	0.477	120	0.903		
		86	0.478				
		88	0.479				
		90	0.480				
		92	0.481				
		94	0.482				
		96	0.483				
		98	0.484				
		100	0.485				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OILS, MISCELLANEOUS: NEATSFOOT

ONF

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Oily liquid	Pale yellow	Peculiar odor
	Floats on water.		
Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
Fire	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire.		
Exposure	Not harmful.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification:  
41130

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Currently not available  
3.2 Symptoms Following Exposure: May cause dermatitis in sensitive individuals (humans)  
3.3 Treatment of Exposure: Currently not available  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 0; LD<sub>50</sub> above 15 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 430°F C.C.  
470°F C.C.  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 828°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD):  
Currently not available  
6.4 Food Chain Concentration Potential:  
None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Various grades designated by pour point (20°-40°); also various refined grades  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: 32 to 14°F = 0 to -10°C = 273 to 263°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.915 at 16°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas):  
Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.1 psia

### NOTES

# OILS, MISCELLANEOUS: NEATSFOOT

ONF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	56.800	85	0.488	35	0.920	100	38.750
52	56.800	90	0.490	40	0.919		
54	56.800	95	0.492	45	0.918		
56	56.800	100	0.493	50	0.917		
58	56.800	105	0.495	55	0.916		
60	56.800	110	0.497	60	0.915		
62	56.800	115	0.498	65	0.914		
64	56.800	120	0.500	70	0.913		
66	56.800	125	0.502	75	0.912		
68	56.800	130	0.503	80	0.911		
70	56.800	135	0.505	85	0.910		
72	56.800	140	0.507	90	0.909		
74	56.800	145	0.508	95	0.908		
76	56.800	150	0.510	100	0.907		
78	56.800			105	0.906		
80	56.800			110	0.905		
82	56.800			115	0.904		
84	56.800			120	0.903		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OILS, FUEL: NO. 1

OON

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> JP-1 Kerosene Kerosine Range oil	Watery liquid  Colorless  Kerosene odor  Floats on water.
Keep people away. Avoid contact with liquid. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Chemical and Physical Treatment: Burn; Absorb Clean shore line Salvage waterfowl	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 33; Miscellaneous Hydrocarbon Mixtures <b>2.2 Formula:</b> Not applicable <b>2.3 IMO/UN Designation:</b> 3.3/1223 <b>2.4 DOT ID No.:</b> 1223 <b>2.5 CAS Registry No.:</b> 8008-20-6 <b>2.6 NAERG Guide No.:</b> 128 <b>2.7 Standard Industrial Trade Classification:</b> 33440
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Protective gloves; goggles or face shield. <b>3.2 Symptoms Following Exposure:</b> INGESTION causes irritation of gastrointestinal tract; pulmonary tract irritation secondary to exhalation of vapors. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema, signs of bronchopneumonia and pneumonitis appear later; minimal central nervous system depression. <b>3.3 Treatment of Exposure:</b> INGESTION: do NOT lavage or induce vomiting; call physician. ASPIRATION: enforce bed rest; administer oxygen; call physician. EYES: wash with plenty of water. SKIN: wipe off and wash with soap and water. <b>3.4 TLV-TWA:</b> Notice of intended change: 100 mg/m <sup>3</sup> (skin) <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 1; LD <sub>50</sub> = 5-15 g/kg <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. <b>3.12 Odor Threshold:</b> 1 ppm <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 100°F C.C.  
**4.2 Flammable Limits in Air:** 0.7%-5%  
**4.3 Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Not pertinent  
**4.7 Auto Ignition Temperature:** 444°F  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** 4 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent.  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
2990 ppm/24 hr/bluegill/TL<sub>m</sub>/fresh water  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** 53%, 5 days  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Light hydrocarbon distillate: 100%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester)  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid  
**8.2 49 CFR Class:** 3  
**8.3 49 CFR Package Group:** III  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** Not pertinent  
**9.3 Boiling Point at 1 atm:** 380 560°F = 193-293°C = 466-566°K  
**9.4 Freezing Point:** -45 to -55°F = -43 to -48°C = 230 to 225°K  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 0.81 0.85 at 15°C (liquid)  
**9.8 Liquid Surface Tension:** 23 32 dynes/cm = 0.023-0.032 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** 47 to 49 dynes/cm = 0.047 to 0.049 N/m at 20°C  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
**9.12 Latent Heat of Vaporization:** 110 Btu/lb = 60 cal/g = 2.5 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -18,540 Btu/lb = -10,300 cal/g = -431.24 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# OILS, FUEL: NO. 1

OON

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	51.430	70	0.469	0	0.926	-35	6.727
36	51.360	75	0.471	10	0.924	-30	6.065
38	51.290	80	0.474	20	0.921	-25	5.482
40	51.220	85	0.476	30	0.919	-20	4.965
42	51.150	90	0.479	40	0.917	-15	4.508
44	51.080	95	0.481	50	0.915	-10	4.101
46	51.010	100	0.484	60	0.913	-5	3.739
48	50.940	105	0.486	70	0.911	0	3.416
50	50.870	110	0.489	80	0.909	5	3.127
52	50.800	115	0.491	90	0.907	10	2.867
54	50.740	120	0.494	100	0.905	15	2.634
56	50.670	125	0.496	110	0.903	20	2.424
58	50.600	130	0.499	120	0.901	25	2.235
60	50.530	135	0.501	130	0.899	30	2.064
62	50.460	140	0.504	140	0.897	35	1.909
64	50.390	145	0.506	150	0.895	40	1.768
66	50.320	150	0.509	160	0.893	45	1.641
68	50.250	155	0.511	170	0.891	50	1.525
70	50.180	160	0.514	180	0.889	55	1.419
72	50.110	165	0.516	190	0.887	60	1.322
74	50.040	170	0.519	200	0.885	65	1.233
76	49.970	175	0.521	210	0.883	70	1.152
78	49.900	180	0.524			75	1.078
80	49.830	185	0.526				
82	49.760	190	0.529				
84	49.690	195	0.531				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.041		N		N
	N	80	0.056		O		O
	S	90	0.075		T		T
	O	100	0.099				
	L	110	0.130		P		P
	U	120	0.168		E		E
	B	130	0.217		R		R
	L	140	0.277		T		T
	E	150	0.350		I		I
		160	0.440		N		N
		170	0.548		E		E
		180	0.679		N		N
		190	0.835		T		T
		200	1.021				
		210	1.241				
		220	1.500				
		230	1.802				
		240	2.154				
		250	2.562				
		260	3.033				
		270	3.573				
		280	4.192				
		290	4.896				
		300	5.695				

# OILS, FUEL: 1-D

OOD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diesel oil (light)	Oily liquid  Yellow-brown  Lube or fuel oil odor  Floats on water.
<b>Keep people away. Avoid contact with liquid. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: 3.1/1270  
2.4 DOT ID No.: 1993  
2.5 CAS Registry No.: 68334-30-5  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 33440

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** INHALATION causes headache and slight giddiness. INGESTION causes nausea, vomiting, and cramping; depression of central nervous system ranging from mild headache to anesthesia, coma, and death; pulmonary irritation secondary to exhalation of solvent; signs of kidney and liver damage may be delayed. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system excitement followed by depression.  
3.3 **Treatment of Exposure:** INGESTION: do NOT induce vomiting; seek medical attention. ASPIRATION: enforce bed rest; administer oxygen. EYES: wash with copious quantity of water. SKIN: remove solvent by wiping and wash with soap and water.  
3.4 **TLV-TWA:** Notice of intended change: 100 mg/m<sup>3</sup> (skin)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5-15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Slight smarting of eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** 0.7 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 100°F C.C.  
4.2 **Flammable Limits in Air:** 1.3%-6%  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 350-625°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
204 mg/1/24 hr/juvenile American shad/TL<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** 20 mg/kg LD<sub>50</sub> (mallard)  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Diesel fuel 1-D (ASTM)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Combustible liquid  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 380-560°F = 193-293°C = 466-566°K  
9.4 **Freezing Point:** -30°F = -34°C = 240°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.81-0.85 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** 23-32 dynes/cm = 0.023-0.032 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 47-49 dynes/cm = 0.047-0.049 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 110 Btu/lb = 60 cal/g = 2.5 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -18,540 Btu/lb = -10,300 cal/g = -431.24 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, FUEL: 1-D

OOD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	51.430	70	0.469	50	0.964	-30	6.065
36	51.360	75	0.471	60	0.964	-25	5.482
38	51.290	80	0.474	70	0.964	-20	4.965
40	51.220	85	0.476	80	0.964	-15	4.508
42	51.150	90	0.479	90	0.964	-10	4.101
44	51.080	95	0.481	100	0.964	-5	3.739
46	51.010	100	0.484	110	0.964	0	3.416
48	50.940	105	0.486	120	0.964	5	3.127
50	50.870	110	0.489	130	0.964	10	2.867
52	50.800	115	0.491	140	0.964	15	2.634
54	50.740	120	0.494	150	0.964	20	2.424
56	50.670	125	0.496	160	0.964	25	2.235
58	50.600	130	0.499	170	0.964	30	2.064
60	50.530	135	0.501	180	0.964	35	1.909
62	50.460	140	0.504	190	0.964	40	1.768
64	50.390	145	0.506	200	0.964	45	1.641
66	50.320	150	0.509			50	1.525
68	50.250	155	0.511			55	1.419
70	50.180	160	0.514			60	1.322
72	50.110	165	0.516			65	1.233
74	50.040	170	0.519			70	1.152
76	49.970	175	0.521			75	1.078
78	49.900	180	0.524				
80	49.830	185	0.526				
82	49.760	190	0.529				
84	49.690	195	0.531				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.041		N		N
	N	80	0.056		O		O
	S	90	0.075		T		T
	O	100	0.099				
	L	110	0.130		P		P
	U	120	0.168		E		E
	B	130	0.217		R		R
	L	140	0.277		T		T
	E	150	0.350		I		I
		160	0.440		N		N
		170	0.548		E		E
		180	0.679		N		N
		190	0.835		T		T
		200	1.021				
		210	1.241				
		220	1.500				
		230	1.802				
		240	2.154				
		250	2.562				
		260	3.033				
		270	3.573				
		280	4.192				
		290	4.896				
		300	5.695				



# OILS, EDIBLE: OLIVE

OOL

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Oily liquid      Pale yellow

Floats on water.

Call fire department.  
Notify local health and pollution control agencies.

### Fire

Combustible.  
Extinguish with dry chemical, foam or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

Not harmful.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Ester  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 9899

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield  
3.2 Symptoms Following Exposure: None-is a food.  
3.3 Treatment of Exposure: No treatment necessary.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: None  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: None  
3.11 Liquid or Solid Characteristics: None  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: 437°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 650°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: Currently not available  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.915 at 20°C (liquid)  
9.8 Liquid Surface Tension: 36 dynes/cm = 0.036 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) = -16,000 Btu/lb = -8,870 cal/g = -371 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.1 psia

## NOTES

# OILS, EDIBLE: OLIVE

OOL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	57.740	35	0.478	65	1.149	30	562.799
52	57.670	40	0.478	70	1.146	35	427.099
54	57.600	45	0.478	75	1.144	40	325.799
56	57.530	50	0.478	80	1.141	45	250.000
58	57.460	55	0.478	85	1.139	50	192.799
60	57.390	60	0.478	90	1.136	55	149.400
62	57.320	65	0.478	95	1.133	60	116.299
64	57.250	70	0.478	100	1.131	65	91.049
66	57.190	75	0.478	105	1.128	70	71.580
68	57.120	80	0.478	110	1.126	75	56.530
70	57.050	85	0.478	115	1.123	80	44.840
72	56.980	90	0.478	120	1.121	85	35.720
74	56.910	95	0.478	125	1.118	90	28.570
76	56.840	100	0.478	130	1.115	95	22.940
78	56.770			135	1.113		
80	56.700			140	1.110		
82	56.630			145	1.108		
84	56.560			150	1.105		
86	56.490						
88	56.420						
90	56.350						
92	56.280						
94	56.210						
96	56.150						
98	56.080						
100	56.010						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	35	0.013		N		N
	N	40	0.016		O		O
	S	45	0.018		T		T
	O	50	0.022				
	L	55	0.026		P		P
	U	60	0.030		E		E
	B	65	0.035		R		R
	L	70	0.041		T		T
	E	75	0.048		I		I
		80	0.056		N		N
		85	0.065		E		E
		90	0.075		N		N
		95	0.086		T		T
		100	0.099				
		105	0.113				
		110	0.129				
		115	0.147				
		120	0.168				

# OILS, FUEL: NO. 1

00N

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms		Watery liquid	Colorless	Kerosene odor
JP-1 Kerosene Kerosine Range oil		Floats on water.		
Keep people away. Avoid contact with liquid. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.				
Fire	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.			
Exposure	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.			
Water Pollution	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn;  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
 Miscellaneous Hydrocarbon Mixture  
 2.2 Formula: Not applicable  
 2.3 IMO/UN Designation: 3.3/1223  
 2.4 DOT ID No.: 1223  
 2.5 CAS Registry No.: 8008-20-6  
 2.6 NAERG Guide No.: 128  
 2.7 Standard Industry Trade Classification: 33440

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
 3.2 **Symptoms Following Exposure:** INGESTION causes irritation of gastrointestinal tract; pulmonary tract irritation secondary to exhalation of vapors. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema, signs of bronchopneumonia and pneumonitis appear later; minimal central nervous system depression.  
 3.3 **Treatment of Exposure:** INGESTION: do NOT lavage or induce vomiting; call physician. ASPIRATION: enforce bed rest; administer oxygen; call physician. EYES: wash with plenty of water. SKIN: wipe off and wash with soap and water.  
 3.4 **TLV-TWA:** Notice of intended change: 100 mg/m<sup>3</sup> (skin)  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5-15 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** 1 ppm  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 100°F C.C.  
 4.2 **Flammable Limits in Air:** 0.7%-5%  
 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 444°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 4 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
 4.14 **Maximum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity in Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 2990 ppm/24 hr/bluegill/TL<sub>m</sub>/fresh water  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** 53%, 5 days  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Light hydrocarbon distillate: 100%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** III  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** Not pertinent  
 9.3 **Boiling Point at 1 atm:** 380 560°F = 193-293°C = 466-566°K  
 9.4 **Freezing Point:** -45 to -55°F = -43 to -48°C = 230 to 225°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.81 0.85 at 15°C (liquid)  
 9.8 **Liquid Surface Tension:** 23 32 dynes/cm = 0.023-0.032 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** 47 to 49 dynes/cm = 0.047 to 0.049 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** 110 Btu/lb = 60 cal/g = 2.5 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -18,540 Btu/lb = -10,300 cal/g = -431.24 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, FUEL: NO. 1

OON

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	51.430	70	0.469	0	0.926	-35	6.727
36	51.360	75	0.471	10	0.924	-30	6.065
38	51.290	80	0.474	20	0.921	-25	5.482
40	51.220	85	0.476	30	0.919	-20	4.965
42	51.150	90	0.479	40	0.917	-15	4.508
44	51.080	95	0.481	50	0.915	-10	4.101
46	51.010	100	0.484	60	0.913	-5	3.739
48	50.940	105	0.486	70	0.911	0	3.416
50	50.870	110	0.489	80	0.909	5	3.127
52	50.800	115	0.491	90	0.907	10	2.867
54	50.740	120	0.494	100	0.905	15	2.634
56	50.670	125	0.496	110	0.903	20	2.424
58	50.600	130	0.499	120	0.901	25	2.235
60	50.530	135	0.501	130	0.899	30	2.064
62	50.460	140	0.504	140	0.897	35	1.909
64	50.390	145	0.506	150	0.895	40	1.768
66	50.320	150	0.509	160	0.893	45	1.641
68	50.250	155	0.511	170	0.891	50	1.525
70	50.180	160	0.514	180	0.889	55	1.419
72	50.110	165	0.516	190	0.887	60	1.322
74	50.040	170	0.519	200	0.885	65	1.233
76	49.970	175	0.521	210	0.883	70	1.152
78	49.900	180	0.524			75	1.078
80	49.830	185	0.526				
82	49.760	190	0.529				
84	49.690	195	0.531				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.041		N		N
	N	80	0.056		O		O
	S	90	0.075		T		T
	O	100	0.099				
	L	110	0.130		P		P
	U	120	0.168		E		E
	B	130	0.217		R		R
	L	140	0.277		T		T
	E	150	0.350		I		I
		160	0.440		N		N
		170	0.548		E		E
		180	0.679		N		N
		190	0.835		T		T
		200	1.021				
		210	1.241				
		220	1.500				
		230	1.802				
		240	2.154				
		250	2.562				
		260	3.033				
		270	3.573				
		280	4.192				
		290	4.896				
		300	5.695				

# OIL, MISC: PINE

OPI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arizole Oleum abietis UN 1272 (DOT) Unipine Yarmor Yarmor pine oil	Liquid  Colorless to pale yellow Turpentine like odor  Floats on water.
Keep people away. Call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Water may be ineffective on fire. Wear self contained breathing apparatus and protective clothing. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, do not induce vomiting.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Dilute and disperse  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment:  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 30; Miscellaneous Hydrocarbon Mixture  
 2.2 **Formula:** Mixture, primarily C<sub>10</sub>H<sub>16</sub>OH  
 2.3 **IMO/UN Designation:** 3.3/1272  
 2.4 **DOT ID No.:** 1272  
 2.5 **CAS Registry No.:** 8002-09-3  
 2.6 **NAERG Guide No.:** 129  
 2.7 **Standard Industrial Trade Classification:** 59812

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Organic canister or air-supplied mask; goggles or face shield; rubber gloves.  
 3.2 **Symptoms Following Exposure:** Vapors can cause headache, confusion, respiratory distress. Liquid irritates skin. If ingested, can irritate the entire digestive system and may injure kidneys. If liquid is taken into lungs, causes severe pneumonitis, pulmonary edema/hemorrhage.  
 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air, call a doctor, administer artificial respiration and oxygen if required. INGESTION: Do not induce vomiting. If vomiting occurs spontaneously, keep victim's head below his hips to prevent his breathing vomitus into his lungs; call a doctor. EYES: Flush with water for at least 15 min. SKIN: Wipe off, wash with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 3.2 g/kg (rat); TD<sub>01</sub> = 4.78g/kg (human)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 180°F C.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, alcohol foam or carbon dioxide.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
 4.5 **Special Hazards of Combustion Products:** Currently not available  
 4.6 **Behavior in Fire:** Forms heavy black smoke and soot.  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Data not pertinent  
 5.5 **Polymerization:** Data not pertinent  
 5.6 **Inhibitor of Polymerization:** Data not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** Currently not available  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 2  
 Human Oral hazard: 1  
 Human Contact hazard: 1  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Currently not available  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** Currently not available  
 7.4 **Venting:** Currently not available  
 7.5 **IMO Pollution Category:** B  
 7.6 **Ship Type:** 3  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable Liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** III  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** alpha terpenol primary component 154.25  
 9.3 **Boiling Point at 1 atm:** >400°F = 204.6°C = 477.75°K  
 9.4 **Freezing Point:** <50°F = <10°C = <283.2°K  
 9.5 **Critical Temperature:** Currently not available  
 9.6 **Critical Pressure:** Currently not available  
 9.7 **Specific Gravity:** 0.95  
 9.8 **Liquid Surface Tension:** Currently not available  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** 5.3  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
 9.12 **Latent Heat of Vaporization:** Currently not available  
 9.13 **Heat of Combustion:** Currently not available  
 9.14 **Heat of Decomposition:** Currently not available  
 9.15 **Heat of Solution:** Currently not available  
 9.16 **Heat of Polymerization:** Currently not available  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OIL, MISC: PINE

OPI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E	68	0.019		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# OILS, EDIBLE: PALM

OPM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Palm butter Palm fruit oil Palm oil	Liquid or solid  Orange-red  Pleasant odor  Floats on water.
Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	LIQUID OR SOLID Not harmful. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 9899

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Oil is essentially nontoxic; may cause mild irritation of eyes.  
3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 373°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing; water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 600°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Various grades, depending on source. Contains 3-45% fatty acids.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCL List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid to liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Not pertinent (very high)  
9.4 **Freezing Point:** 70–80°F = 21–27°C = 294–300°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.906 at 38°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 37°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 37°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) –15,500 Btu/lb = –8,600 cal/g = –360 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

NOTES

# OILS, EDIBLE: PALM

OPM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
99	56.190	99	0.480	35	0.918		N O T  P E R T I N E N T
100	56.170	100	0.480	40	0.917		
101	56.140	101	0.480	45	0.916		
102	56.110	102	0.480	50	0.915		
103	56.080	103	0.480	55	0.914		
104	56.060	104	0.480	60	0.913		
105	56.030	105	0.480	65	0.912		
106	56.000	106	0.480	70	0.911		
107	55.970	107	0.480	75	0.909		
108	55.940	108	0.480	80	0.908		
109	55.920	109	0.480	85	0.907		
110	55.890	110	0.480	90	0.906		
111	55.860	111	0.480	95	0.905		
112	55.830	112	0.480	100	0.904		
113	55.910	113	0.480	105	0.903		
114	55.780	114	0.480	110	0.902		
115	55.750	115	0.480	115	0.900		
116	55.720	116	0.480	120	0.899		
117	55.690	117	0.480				
118	55.670	118	0.480				
119	55.640	119	0.480				
120	55.610	120	0.480				
121	55.580	121	0.480				
122	55.560	122	0.480				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# OILS, EDIBLE: PEANUT

OPN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Oily liquid Pale yellow Weak peanut odor  Floats on water.
Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Not harmful.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 9899

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield.  
3.2 Symptoms Following Exposure: None-is a food.  
3.3 Treatment of Exposure: EYES: flush with water for at least 15 min.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: None  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: None  
3.11 Liquid or Solid Characteristics: None  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 640°F O.C. 540°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 833°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: 28°F = -2°C = 271°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.919 at 20°C (liquid)  
9.8 Liquid Surface Tension: 35.5 dynes/cm = 0.0355 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: 30 dynes/cm = 0.030 N/m at 70°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -16,000 Btu/lb = -8,870 cal/g = -371 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.1 psia

### NOTES

# OILS, EDIBLE: PEANUT

OPN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	57.740	40	0.493	50	1.179	50	3909.000
52	57.670	50	0.495	60	1.179	55	3027.000
54	57.600	60	0.497	70	1.179	60	2356.000
56	57.530	70	0.500	80	1.179	65	1842.000
58	57.460	80	0.502	90	1.179	70	1448.000
60	57.390	90	0.504	100	1.179	75	1142.000
62	57.320	100	0.506	110	1.179	80	905.500
64	57.250	110	0.509	120	1.179	85	720.799
66	57.190	120	0.511	130	1.179	90	576.199
68	57.120	130	0.513	140	1.179	95	462.399
70	57.050	140	0.515	150	1.179	100	372.599
72	56.980	150	0.518	160	1.179	105	301.399
74	56.910	160	0.520	170	1.179	110	244.699
76	56.840	170	0.522	180	1.179	115	199.299
78	56.770	180	0.524	190	1.179	120	163.000
80	56.700	190	0.526	200	1.179	125	133.699
82	56.630	200	0.529	210	1.179	130	110.099
84	56.560					135	90.940
86	56.490						
88	56.420						
90	56.350						
92	56.280						
94	56.210						
96	56.150						
98	56.080						
100	56.010						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	35	0.013		N		N
	N	40	0.016		O		O
	S	45	0.018		T		T
	O	50	0.022				
	L	55	0.026		P		P
	U	60	0.030		E		E
	B	65	0.035		R		R
	L	70	0.041		T		T
	E	75	0.048		I		I
		80	0.056		N		N
		85	0.065		E		E
		90	0.075		N		N
		95	0.086		T		T
		100	0.099				
		105	0.113				
		110	0.129				
		115	0.147				
		120	0.168				

# OILS, MISCELLANEOUS: PENETRATING

OPT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Preservative oil Water displacing oil	Oily liquid                      Yellow                      Motor oil-like odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn;  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

**2.1 CG Compatibility Group:** 33;  
 Miscellaneous Hydrocarbon Mixtures  
**2.2 Formula:** Not applicable  
**2.3 IMO/UN Designation:** 3.3/1270  
**2.4 DOT ID No.:** 1268  
**2.5 CAS Registry No.:** Currently not available  
**2.6 NAERG Guide No.:** 128  
**2.7 Standard Industrial Trade Classification:** 33450

### 3. HEALTH HAZARDS

**3.1 Personal Protective Equipment:** Protective gloves; goggles or face shield.  
**3.2 Symptoms Following Exposure:** Liquid may irritate stomach and increase frequency of bowel movements.  
**3.3 Treatment of Exposure:** INGESTION: have victim drink water or milk; do NOT induce vomiting. ASPIRATION: check for delayed development of pulmonary irritation by serial x-rays. EYES: wash with copious amounts of water. SKIN: wipe off, wash with soap and water.  
**3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

**4.1 Flash Point:** 295°F  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Not pertinent  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent.  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

**5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

**6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

**7.1 Grades of Purity:** Commercial  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester)  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

**8.1 49 CFR Category:** Flammable liquid  
**8.2 49 CFR Class:** 3  
**8.3 49 CFR Package Group:** III  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

**9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** Not pertinent  
**9.3 Boiling Point at 1 atm:** Very high  
**9.4 Freezing Point:** Not pertinent  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 0.8961 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** 29.8 dynes/cm = 0.0298 N/m at 24°C  
**9.9 Liquid Water Interfacial Tension:** 5.5 dynes/cm = 0.0055 N/m at 22°C  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
**9.12 Latent Heat of Vaporization:** Not pertinent  
**9.13 Heat of Combustion:** (est.) -18,000 Btu/lb = -10,000 cal/g = -420 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, MISCELLANEOUS: PENETRATING

OPT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
45	56.350	85	0.420	35	0.920	46	45.490
50	56.240	90	0.431	40	0.919	48	43.080
55	56.130	95	0.442	45	0.918	50	40.810
60	56.020	100	0.453	50	0.917	52	38.680
65	55.910	105	0.464	55	0.916	54	36.680
70	55.800	110	0.474	60	0.915	56	34.790
75	55.680	115	0.485	65	0.914	58	33.020
80	55.570	120	0.496	70	0.913	60	31.340
85	55.460	125	0.507	75	0.912	62	29.770
90	55.350	130	0.518	80	0.911	64	28.280
95	55.230	135	0.529	85	0.910	66	26.880
100	55.120	140	0.539	90	0.909	68	25.560
105	55.010	145	0.550	95	0.908	70	24.310
110	54.890	150	0.561	100	0.907	72	23.140
115	54.780			105	0.906	74	22.020
				110	0.905	76	20.970
				115	0.904	78	19.980
				120	0.903	80	19.040
						82	18.150
						84	17.310
						86	16.510
						88	15.760
						90	15.040
						92	14.360
						94	13.720
						96	13.110

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	55	0.434		N		N
	N	60	0.464		O		O
	S	65	0.496		T		T
	O	70	0.529				
	L	75	0.564		P		P
	U	80	0.601		E		E
	B	85	0.639		R		R
	I	90	0.679		T		T
	E	95	0.721		I		I
		100	0.764		N		N
		105	0.810		E		E
		110	0.857		N		N
		115	0.906		T		T
		120	0.956				
		125	1.009				
		130	1.063				

# OILS, MISCELLANEOUS: ROAD

ORD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Liquid asphalt Petroleum asphalt Slow curing asphalt	Oily liquid      Black      Tar odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim; Dredge  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 33;  
 Miscellaneous Hydrocarbon Mixtures  
 2.2 **Formula:** Not applicable  
 2.3 **IMO/UN Designation:** 3.2/1999; 3.3/1999  
 2.4 **DOT ID No.:** 1999  
 2.5 **CAS Registry No.:** Currently not available  
 2.6 **NAERG Guide No.:** 130  
 2.7 **Standard Industrial Trade Classification:** 33429

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Protective clothing for hot asphalt; face and eye protection when hot.  
 3.2 **Symptoms Following Exposure:** Contact with skin may cause dermatitis. Inhalation of vapors may cause moderate irritation of nose and throat. Hot liquid burns skin.  
 3.3 **Treatment of Exposure:** Severe burns may result from hot liquid. Cool the skin at once with water. Cover burn with sterile dressing and seek medical attention.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None observed  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 300–550°F  
 4.2 **Flammable Limits in Air:** Not pertinent  
 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 400–700°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** SC-0 to SC-5  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** Not pertinent  
 9.3 **Boiling Point at 1 atm:** Very high  
 9.4 **Freezing Point:** Not pertinent  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 1.0–1.2 at 25°C (liquid)  
 9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** (est.) –18,000 Btu/lb = –10,000 cal/g = –420 X 10<sup>3</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, MISCELLANEOUS: ROAD

ORD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	62.420	50	0.460	35	0.920	50	9.343
52	62.420	52	0.461	40	0.919	52	8.841
54	62.420	54	0.462	45	0.918	54	8.370
56	62.420	56	0.463	50	0.917	56	7.927
58	62.420	58	0.464	55	0.916	58	7.511
60	62.420	60	0.465	60	0.915	60	7.119
62	62.420	62	0.466	65	0.914	62	6.751
64	62.420	64	0.467	70	0.913	64	6.404
66	62.420	66	0.468	75	0.912	66	6.078
68	62.420	68	0.469	80	0.911	68	5.770
70	62.420	70	0.470	85	0.910	70	5.481
72	62.420	72	0.471	90	0.909	72	5.207
74	62.420	74	0.472	95	0.908	74	4.950
76	62.420	76	0.473	100	0.907	76	4.707
78	62.420	78	0.474	105	0.906	78	4.477
80	62.420	80	0.475	110	0.905	80	4.260
82	62.420	82	0.476	115	0.904	82	4.056
84	62.420	84	0.477	120	0.903	84	3.862
		86	0.478				
		88	0.479				
		90	0.480				
		92	0.481				
		94	0.482				
		96	0.483				
		98	0.484				
		100	0.485				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OILS, MISCELLANEOUS: RANGE

ORG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Fuel oil no. 1 JP-1 Kerosene Kerosine	Watery liquid      Colorless      Kerosene odor  Floats on water.
Keep people away. Avoid contact with liquid. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn;  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
 Miscellaneous Hydrocarbon Mixtures  
 2.2 Formula: Not applicable  
 2.3 IMO/UN Designation: 3.3/1223  
 2.4 DOT ID No.: 1223  
 2.5 CAS Registry No.: Currently not available  
 2.6 NAERG Guide No.: 128  
 2.7 Standard Industrial Trade Classification: 33429

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
 3.2 **Symptoms Following Exposure:** Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema.  
 3.3 **Treatment of Exposure:** ASPIRATION: enforce bed rest; administer oxygen; call a doctor.  
 INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with copious amounts of water.  
 SKIN: wipe off and wash with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause slight smarting of eyes and respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** 1 ppm  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 100°F C.C.  
 4.2 **Flammable Limits in Air:** 0.7%-5%  
 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 444°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 4 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 2990 ppm/24 hr/bluegill/TL<sub>m</sub>/fresh water  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** 53%, 5 days  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Light hydrocarbon distillate: 100%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** III  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** Not pertinent  
 9.3 **Boiling Point at 1 atm:** 392–500°F = 200–260°C = 473–533°K  
 9.4 **Freezing Point:** –45 to –55°F = –43 to –48°C = 230 to 225°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.80–0.85 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 23–32 dynes/cm = 0.023–0.032 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** 47–49 dynes/cm = 0.047–0.049 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** 108 Btu/lb = 60 cal/g = 2.51 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** –18,540 Btu/lb = –10,300 cal/g = –431.24 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, MISCELLANEOUS: RANGE

ORG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	50.810	50	0.460	35	0.920	-35	6.727
36	50.740	52	0.461	40	0.919	-30	6.065
38	50.670	54	0.462	45	0.918	-25	5.482
40	50.600	56	0.463	50	0.917	-20	4.965
42	50.530	58	0.464	55	0.916	-15	4.508
44	50.460	60	0.465	60	0.915	-10	4.101
46	50.390	62	0.466	65	0.914	-5	3.739
48	50.320	64	0.467	70	0.913	0	3.416
50	50.250	66	0.468	75	0.912	5	3.127
52	50.180	68	0.469	80	0.911	10	2.867
54	50.110	70	0.470	85	0.910	15	2.634
56	50.040	72	0.471	90	0.909	20	2.424
58	49.970	74	0.472	95	0.908	25	2.235
60	49.900	76	0.473	100	0.907	30	2.064
62	49.830	78	0.474	105	0.906	35	1.909
64	49.760	80	0.475	110	0.905	40	1.768
66	49.700	82	0.476	115	0.904	45	1.641
68	49.630	84	0.477	120	0.903	50	1.525
70	49.560	86	0.478			55	1.419
72	49.490	88	0.479			60	1.322
74	49.420	90	0.480			65	1.233
76	49.350	92	0.481			70	1.152
78	49.280	94	0.482			75	1.078
80	49.210	96	0.483				
82	49.140	98	0.484				
84	49.070	100	0.485				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	I	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				



# OILS, MISCELLANEOUS: ROSIN

ORN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Codoil Resin oil Retinol Rosinol	Liquid  Floats on water.	Light amber to red to black  	Pinetree pitch odor
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical or carbon dioxide. Water may be ineffective on fire.		
<b>Exposure</b>	CALL FOR MEDICAL AID. Exposure data not available. Flush affected areas with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: 3.2/1286  
2.4 DOT ID No.: 1286  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 33429

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Currently not available  
3.2 Symptoms Following Exposure: Currently not available  
3.3 Treatment of Exposure: Currently not available  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: No data available, but toxicity is probably low.  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 255–390°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 648°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: A Variety of grades that differ primarily in color and flash point.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: B  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: 572–750°F = 300–400°C = 573–673°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.96–1.02 at 15°C (liquid)  
9.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) –18,000 Btu/lb = –10,000 cal/g = –420 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Low

### NOTES

# OILS, MISCELLANEOUS: ROSIN

ORN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	59.930	50	0.460	35	0.920	212	18.350
52	59.930	52	0.461	40	0.919		
54	59.930	54	0.462	45	0.918		
56	59.930	56	0.463	50	0.917		
58	59.930	58	0.464	55	0.916		
60	59.930	60	0.465	60	0.915		
62	59.930	62	0.466	65	0.914		
64	59.930	64	0.467	70	0.913		
66	59.930	66	0.468	75	0.912		
68	59.930	68	0.469	80	0.911		
70	59.930	70	0.470	85	0.910		
72	59.930	72	0.471	90	0.909		
74	59.930	74	0.472	95	0.908		
76	59.930	76	0.473	100	0.907		
78	59.930	78	0.474	105	0.906		
80	59.930	80	0.475	110	0.905		
82	59.930	82	0.476	115	0.904		
84	59.930	84	0.477	120	0.903		
		86	0.478				
		88	0.479				
		90	0.480				
		92	0.481				
		94	0.482				
		96	0.483				
		98	0.484				
		100	0.485				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OILS, MISCELLANEOUS: RESIN

ORS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Codoil Retinol Rosin oil Rosinol	Liquid  Light amber to red to black  Pinetree pitch odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID. Exposure data not available. Flush affected areas with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** Not applicable  
2.3 **IMO/UN Designation:** 3.2/1286  
2.4 **DOT ID No.:** 1286  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 127  
2.7 **Standard Industrial Trade Classification:** 33429

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Currently not available  
3.2 **Symptoms Following Exposure:** Currently not available  
3.3 **Treatment of Exposure:** Currently not available  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Data not available, but toxicity is probably low.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 255–390°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 648°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** A variety of grades that differ primarily in color and flash point.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 572–750°F = 300–400°C = 573-673°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.96–1.02 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) –18,000 Btu/lb = –10,000 cal/g = –420 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, MISCELLANEOUS: RESIN

ORS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	59.930	50	0.460	35	0.920	212	18.350
52	59.930	52	0.461	40	0.919		
54	59.930	54	0.462	45	0.918		
56	59.930	56	0.463	50	0.917		
58	59.930	58	0.464	55	0.916		
60	59.930	60	0.465	60	0.915		
62	59.930	62	0.466	65	0.914		
64	59.930	64	0.467	70	0.913		
66	59.930	66	0.468	75	0.912		
68	59.930	68	0.469	80	0.911		
70	59.930	70	0.470	85	0.910		
72	59.930	72	0.471	90	0.909		
74	59.930	74	0.472	95	0.908		
76	59.930	76	0.473	100	0.907		
78	59.930	78	0.474	105	0.906		
80	59.930	80	0.475	110	0.905		
82	59.930	82	0.476	115	0.904		
84	59.930	84	0.477	120	0.903		
		86	0.478				
		88	0.479				
		90	0.480				
		92	0.481				
		94	0.482				
		96	0.483				
		98	0.484				
		100	0.485				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OILS, EDIBLE: SOYA BEAN

OSB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Soybean oil		Oily liquid	Pale yellow	Weak odor
		Floats on water.		
Call fire department. Notify local health and pollution control agencies.				
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.			
<b>Exposure</b>	Not harmful.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 9899

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield.  
3.2 Symptoms Following Exposure: None-is a food.  
3.3 Treatment of Exposure: EYES: flush with water for at least 15 min.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: None  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: None  
3.11 Liquid or Solid Characteristics: None  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 540°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 833°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 39%, 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Refined; crude  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: -4°F = -20°C = 253°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.922 at 20°C (liquid)  
9.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -16,000 Btu/lb = -8,870 cal/g = -371 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.10 psia

NOTES

# OILS, EDIBLE: SOYA BEAN

OSB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	56.800	30	0.447	50	1.179	50	3909.000
52	56.730	40	0.450	60	1.179	55	3027.000
54	56.670	50	0.453	70	1.179	60	2356.000
56	56.600	60	0.456	80	1.179	65	1842.000
58	56.530	70	0.459	90	1.179	70	1448.000
60	56.460	80	0.463	100	1.179	75	1142.000
62	56.390	90	0.466	110	1.179	80	905.500
64	56.320	100	0.469	120	1.179	85	720.799
66	56.250	110	0.472	130	1.179	90	576.199
68	56.180	120	0.475	140	1.179	95	462.399
70	56.110	130	0.478	150	1.179	100	372.599
72	56.040	140	0.481	160	1.179	105	301.399
74	55.970	150	0.485	170	1.179	110	244.699
76	55.900	160	0.488	180	1.179	115	199.299
78	55.830	170	0.491	190	1.179	120	163.000
80	55.760	180	0.494	200	1.179	125	133.699
82	55.690			210	1.179	130	110.099
84	55.630					135	90.940
86	55.560						
88	55.490						
90	55.420						
92	55.350						
94	55.280						
96	55.210						
98	55.140						
100	55.070						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	35	0.013		N		N
	N	40	0.016		O		O
	S	45	0.018		T		T
	O	50	0.022				
	L	55	0.026		P		P
	U	60	0.030		E		E
	B	65	0.035		R		R
	L	70	0.041		T		T
	E	75	0.048		I		I
		80	0.056		N		N
		85	0.065		E		E
		90	0.075		N		N
		95	0.086		T		T
		100	0.099				
		105	0.113				
		110	0.129				
		115	0.147				
		120	0.168				

# OILS, MISCELLANEOUS: SPINDLE

OSD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bearing oil High speed bearing oil	Oily liquid  Light brown  Weak kerosene-like odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** Not applicable  
2.3 **IMO/UN Designation:** 3.3/1270  
2.4 **DOT ID No.:** 1268  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 127  
2.7 **Standard Industrial Trade Classification:** 33450

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema.  
3.3 **Treatment of Exposure:** ASPIRATION: enforce bed rest; administer oxygen; call a doctor.  
INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with copious amounts of water.  
SKIN: wipe off and wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 169°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 478°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 2990 ppm/24 hr/bluegill/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 53%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Several grades, all with same hazard assessment.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Very high  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.881 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, MISCELLANEOUS: SPINDLE

OSD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	54.930	10	0.417	65	0.977	100	25.850
52	54.930	15	0.419	70	0.977		
54	54.930	20	0.422	75	0.977		
56	54.930	25	0.424	80	0.977		
58	54.930	30	0.426	85	0.977		
60	54.930	35	0.429	90	0.977		
62	54.930	40	0.431	95	0.977		
64	54.930	45	0.434	100	0.977		
66	54.930	50	0.436	105	0.977		
68	54.930	55	0.438	110	0.977		
70	54.930	60	0.441	115	0.977		
72	54.930	65	0.443	120	0.977		
74	54.930	70	0.445	125	0.977		
76	54.930	75	0.448	130	0.977		
78	54.930	80	0.450	135	0.977		
80	54.930	85	0.453	140	0.977		
82	54.930	90	0.455	145	0.977		
84	54.930	95	0.457	150	0.977		
		100	0.460	155	0.977		
		105	0.462	160	0.977		
				165	0.977		
				170	0.977		
				175	0.977		
				180	0.977		
				185	0.977		
				190	0.977		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				



# OILS, EDIBLE: SAFFLOWER

OSF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carthamus tinctorius oil Safflower oil Safflower seed oil	Liquid  Light yellow  Bland fatty odor  Floats on water.
Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	LIQUID Not harmful. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula: Not applicable  
2.3 IMO/IUN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 9899

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Oil is essentially nontoxic. Contact with eyes can cause mild irritation.  
3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
Currently not available  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective; water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Food grade: contains 0.02% propyl gallate, 0.01% citric acid, or may contain no additives. Technical: non-break and alkali-refined  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Not pertinent (very high)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.923 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -15,500 Btu/lb = -8,600 cal/g = -360 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, EDIBLE: SAFFLOWER

OSF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	58.120	52	0.480	35	0.918		N O T  P E R T I N E N T
54	58.070	54	0.480	40	0.917		
56	58.010	56	0.480	45	0.916		
58	57.960	58	0.480	50	0.915		
60	57.900	60	0.480	55	0.914		
62	57.840	62	0.480	60	0.913		
64	57.790	64	0.480	65	0.912		
66	57.730	66	0.480	70	0.911		
68	57.680	68	0.480	75	0.909		
70	57.620	70	0.480	80	0.908		
72	57.570	72	0.480	85	0.907		
74	57.510	74	0.480	90	0.906		
76	57.460	76	0.480	95	0.905		
78	57.400	78	0.480	100	0.904		
80	57.350	80	0.480	105	0.903		
82	57.290	82	0.480	110	0.902		
84	57.230	84	0.480	115	0.900		
86	57.180	86	0.480	120	0.899		
88	57.120	88	0.480				
90	57.070	90	0.480				
92	57.010	92	0.480				
94	56.960	94	0.480				
96	56.900	96	0.480				
98	56.850	98	0.480				
100	56.790	100	0.480				
102	56.730	102	0.480				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# OILS, MISCELLANEOUS: SPERM

OSP

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Oily liquid Pale yellow

Floats on water.

Call fire department.  
Avoid contact with liquid.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Combustible.  
Extinguish with foam, dry chemical, or carbon dioxide.  
Water may be ineffective on fire.

### Exposure

CALL FOR MEDICAL AID.  
Exposure data not available.  
Flush affected areas with plenty of water.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** Not applicable  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:**  
41110

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Currently not available  
3.2 **Symptoms Following Exposure:** Currently not available  
3.3 **Treatment of Exposure:** Currently not available  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Data not available, but toxicity is probably low.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 428°F C.C.  
(No. 1); 460°F C.C. (No. 2); 500–510°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 586°F (No. 1)  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** No. 1, No. 2, Winterized (these differ in purity and flash point)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Very high  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.882 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** 5.7 dynes/cm = 0.0057 N/m at 30°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** –17,900 Btu/lb = –9943 cal/g = –416.3 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.1 psia

## NOTES

# OILS, MISCELLANEOUS: SPERM

OSP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	54.930	50	0.460	35	0.920	100	17.150
52	54.930	52	0.461	40	0.919		
54	54.930	54	0.462	45	0.918		
56	54.930	56	0.463	50	0.917		
58	54.930	58	0.464	55	0.916		
60	54.930	60	0.465	60	0.915		
62	54.930	62	0.466	65	0.914		
64	54.930	64	0.467	70	0.913		
66	54.930	66	0.468	75	0.912		
68	54.930	68	0.469	80	0.911		
70	54.930	70	0.470	85	0.910		
72	54.930	72	0.471	90	0.909		
74	54.930	74	0.472	95	0.908		
76	54.930	76	0.473	100	0.907		
78	54.930	78	0.474	105	0.906		
80	54.930	80	0.475	110	0.905		
82	54.930	82	0.476	115	0.904		
84	54.930	84	0.477	120	0.903		
		86	0.478				
		88	0.479				
		90	0.480				
		92	0.481				
		94	0.482				
		96	0.483				
		98	0.484				
		100	0.485				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OILS, FUEL: NO. 6

OSX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bunker C oil No. 6 Residual fuel oil	Thick heated liquid  Usually floats on water.	Black	Tar odor
Shut off ignition sources and call fire department. Keep people away. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn;  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 33;  
 Miscellaneous hydrocarbon mixture  
 2.2 **Formula:** Not listed  
 2.3 **IMO/UN Designation:** 3.3/1223  
 2.4 **DOT ID No.:** 1993  
 2.5 **CAS Registry No.:** Currently not available  
 2.6 **NAERG Guide No.:** 128  
 2.7 **Standard Industrial Trade Classification:** 33440

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
 3.2 **Symptoms Following Exposure:** INGESTION: gastrointestinal irritation. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure.  
 3.3 **Treatment of Exposure:** INGESTION: do NOT lavage or induce vomiting. ASPIRATION: treatment probably not required; delayed development of pulmonary irritation can be detected by serial chest x-rays; consider prophylactic antibiotic regime if condition warrants. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.  
 3.4 **TLV-TWA:** Notice of intended change: Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** None  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** >150°F C.C.  
 4.2 **Flammable Limits in Air:** 1%-5%  
 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 765°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 4 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
 2400 ppm/48 hr/juvenile American shad/TL<sub>w</sub>/fresh water  
 2417 mg/l/48 hr/juvenile American shad/TL<sub>w</sub>/salt water  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** Currently not available  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial  
 7.2 **Storage Temperature:** Elevated  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** III  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** Not pertinent  
 9.3 **Boiling Point at 1 atm:** 415-->1093°F = 212-->588°C = 485-->861°K  
 9.4 **Freezing Point:** 25 to 55°F = -4 to +13°C = 269 to 286°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.95 (approx.) at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** -18,000 Btu/lb = -10,000 cal/g = -418.68 X 10<sup>3</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, FUEL: NO. 6

OSX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	60.300	50	0.460	40	0.846	100	493.500
52	60.300	52	0.461	45	0.846		
54	60.300	54	0.462	50	0.846		
56	60.300	56	0.463	55	0.846		
58	60.300	58	0.464	60	0.846		
60	60.300	60	0.465	65	0.846		
62	60.300	62	0.466	70	0.846		
64	60.300	64	0.467	75	0.846		
66	60.300	66	0.468	80	0.846		
68	60.300	68	0.469	85	0.846		
70	60.300	70	0.470	90	0.846		
72	60.300	72	0.471	95	0.846		
74	60.300	74	0.472	100	0.846		
76	60.300	76	0.473	105	0.846		
78	60.300	78	0.474				
80	60.300	80	0.475				
82	60.300	82	0.476				
84	60.300	84	0.477				
		86	0.478				
		88	0.479				
		90	0.480				
		92	0.481				
		94	0.482				
		96	0.483				
		98	0.484				
		100	0.485				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	70	0.042		N O T		N O T
		75	0.049				
		80	0.057				
		85	0.065				
		90	0.076		P E R T I N E N T		P E R T I N E N T
		95	0.087				
		100	0.100				
		105	0.114				
		110	0.131				
		115	0.149				
		120	0.170				
		125	0.193				
		130	0.218				
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OILS, MISCELLANEOUS: SPRAY

OSY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dormant oil Foliage oil Kerosene, heavy Plant spray oil			
	Oily liquid	Light brown	Kerosene-like odor
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** Not applicable  
2.3 **IMO/UN Designation:** 3.3/1270  
2.4 **DOT ID No.:** 1268  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 128  
2.7 **Standard Industrial Trade Classification:** 33450

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing edema.  
3.3 **Treatment of Exposure:** ASPIRATION: enforce bed rest; administer oxygen; call a doctor.  
INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with copious amounts of water.  
SKIN: wipe off and wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 1 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 140°F (min.) C.C.  
4.2 **Flammable Limits in Air:** 0.6%-4.6%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 475°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 500 ppm"/salmon fingerling/lethal/fresh water  
\*Time period not specified  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 53%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** 590–700°F = 310–371°C = 583–644°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.82 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** –18,540 Btu/lb = –10,300 cal/g = –431.24 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, MISCELLANEOUS: SPRAY

OSY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	52.050	50	0.460	35	0.920	-35	10.600
36	51.980	52	0.461	40	0.919	-30	9.614
38	51.910	54	0.462	45	0.918	-25	8.739
40	51.850	56	0.463	50	0.917	-20	7.960
42	51.780	58	0.464	55	0.916	-15	7.266
44	51.710	60	0.465	60	0.915	-10	6.646
46	51.640	62	0.466	65	0.914	-5	6.090
48	51.570	64	0.467	70	0.913	0	5.592
50	51.500	66	0.468	75	0.912	5	5.144
52	51.430	68	0.469	80	0.911	10	4.740
54	51.360	70	0.470	85	0.910	15	4.376
56	51.290	72	0.471	90	0.909	20	4.046
58	51.220	74	0.472	95	0.908	25	3.747
60	51.150	76	0.473	100	0.907	30	3.476
62	51.080	78	0.474	105	0.906	35	3.229
64	51.010	80	0.475	110	0.905	40	3.004
66	50.940	82	0.476	115	0.904	45	2.799
68	50.870	84	0.477	120	0.903	50	2.612
70	50.800	86	0.478			55	2.440
72	50.740	88	0.479			60	2.282
74	50.670	90	0.480			65	2.138
76	50.600	92	0.481			70	2.005
78	50.530	94	0.482			75	1.883
80	50.460	96	0.483				
82	50.390	98	0.484				
84	50.320	100	0.485				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				



# OCTANOL

OTA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Alcohol C-8 Heptylcarbinol 1-Octanol Octyl alcohol	Thick liquid  Colorless  Sweet odor  Floats on water.
<b>Keep people away.</b> <b>Call fire department.</b> <b>Avoid contact with liquid.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 20; Alcohol, glycol  
2.2 **Formula:** C<sub>8</sub>H<sub>17</sub>OH  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 111-87-5  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51214

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical gloves and chemical goggles.  
3.2 **Symptoms Following Exposure:** Irritates skin and eyes.  
3.3 **Treatment of Exposure:** Flush with copious amounts of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; oral rat LD<sub>50</sub> > 3.2 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** 0.49 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 178°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 3.7 mm/min. (approx.)  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 17.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 109%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: O  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 130.23  
9.3 **Boiling Point at 1 atm:** 383°F = 195°C = 468°K  
9.4 **Freezing Point:** 5°F = -15°C = 258°K  
9.5 **Critical Temperature:** 725.0°F = 385°C = 658.2°K  
9.6 **Critical Pressure:** 400 psia = 27 atm = 2.7 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.829 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 27.5 dynes/cm = 0.0275 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 8.52 dynes/cm = 0.00852 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.044  
9.12 **Latent Heat of Vaporization:** 176 Btu/lb = 97.5 cal/g = 4.08 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -16,130 Btu/lb = -8,963 cal/g = -375.3 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OCTANOL

OTA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	52.660	68	0.499	95	1.113	55	11.840
40	52.520	69	0.499	100	1.110	60	10.630
45	52.380	70	0.499	105	1.107	65	9.555
50	52.240	71	0.499	110	1.104	70	8.609
55	52.100	72	0.499	115	1.101	75	7.772
60	51.960	73	0.499	120	1.098	80	7.029
65	51.820	74	0.499	125	1.095	85	6.369
70	51.680	75	0.499	130	1.092	90	5.781
75	51.540	76	0.499	135	1.089	95	5.257
80	51.400	77	0.499	140	1.086	100	4.789
85	51.260	78	0.499	145	1.083	105	4.369
90	51.120	79	0.499	150	1.080	110	3.993
95	50.980	80	0.499	155	1.077	115	3.654
100	50.840	81	0.499	160	1.074	120	3.350
105	50.700	82	0.499	165	1.071	125	3.075
110	50.560	83	0.499	170	1.068	130	2.827
115	50.420	84	0.499			135	2.603
120	50.280	85	0.499			140	2.400
125	50.130						
130	49.990						
135	49.850						
140	49.710						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.600	80	0.002	80	0.00004	0	0.328
		100	0.005	100	0.00011	25	0.342
		120	0.013	120	0.00028	50	0.355
		140	0.032	140	0.00065	75	0.369
		160	0.070	160	0.00138	100	0.382
		180	0.144	180	0.00273	125	0.396
		200	0.275	200	0.00507	150	0.409
		220	0.497	220	0.00888	175	0.422
		240	0.854	240	0.01481	200	0.435
		260	1.404	260	0.02367	225	0.447
		280	2.219	280	0.03639	250	0.460
		300	3.388	300	0.05410	275	0.472
		320	5.016	320	0.07805	300	0.485
		340	7.225	340	0.10960	325	0.497
		360	10.150	360	0.15030	350	0.509
		380	13.950	380	0.20160	375	0.521
		400	18.790	400	0.26520	400	0.532
		420	24.850	420	0.34280	425	0.544
		440	32.320	440	0.43590	450	0.555
		460	41.400	460	0.54620	475	0.567
		480	52.300	480	0.67530	500	0.578
						525	0.589
						550	0.600
						575	0.611
						600	0.621

# OILS, MISCELLANEOUS: TURBINE

OTB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Steam turbine lube oil Steam turbine oil Turbine oil	Liquid  Colorless to light brown  Kerosene-like odor  Floats on water.
<b>Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous hydrocarbon mixture  
2.2 **Formula:** Not pertinent  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:**  
33450

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Contact with liquid causes slight irritation of eyes and (on prolonged contact) skin. Ingestion causes slight irritation of stomach and bowel, increased frequency of bowel movement.  
3.3 **Treatment of Exposure:** EYES: wash with copious quantity of water for at least 15 min. SKIN: wipe off; wash with soap and water. INGESTION: do NOT induce vomiting; do NOT lavage; 2-4 oz. olive oil and 1-2 oz. activated charcoal may be given.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> > 15 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
390–485°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide, water fog.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing; water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 700°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** (approx.) 4mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Solvent refined paraffinic oils; 98.5+%. Grades vary in viscosity and flash point.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.87 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 25 dynes/cm = 0.025 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 50 dynes/cm = 0.050 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) –17,600 Btu/lb = –9,800 cal/g = –410 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, MISCELLANEOUS: TURBINE

OTB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	55.210	52	0.480	35	0.918		N O T  P E R T I N E N T
44	55.140	54	0.480	40	0.917		
46	55.070	56	0.480	45	0.916		
48	55.000	58	0.480	50	0.915		
50	54.930	60	0.480	55	0.914		
52	54.860	62	0.480	60	0.913		
54	54.790	64	0.480	65	0.912		
56	54.720	66	0.480	70	0.911		
58	54.650	68	0.480	75	0.909		
60	54.580	70	0.480	80	0.908		
62	54.520	72	0.480	85	0.907		
64	54.450	74	0.480	90	0.906		
66	54.380	76	0.480	95	0.905		
68	54.310	78	0.480	100	0.904		
70	54.240	80	0.480	105	0.903		
72	54.170	82	0.480	110	0.902		
74	54.100	84	0.480	115	0.900		
76	54.030	86	0.480	120	0.899		
78	53.960						
80	53.890						
82	53.820						
84	53.750						
86	53.680						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# OILS, EDIBLE: TUCUM

OTC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> American palm kernel oil Aouara oil Palm seed oil Tucum oil	Liquid Light yellow Weak odor
	Floats on water.
Call fire department. Notify local health and pollution control agencies. Avoid contact with liquid.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	LIQUID Not harmful. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment:  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
 2.2 Formula: Not applicable  
 2.3 IMO/UN Designation: Not listed  
 2.4 DOT ID No.: Not listed  
 2.5 CAS Registry No.: Currently not available  
 2.6 NAERG Guide No.: Not listed  
 2.7 Standard Industrial Trade Classification: 9899

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
 3.2 **Symptoms Following Exposure:** Oil is essentially nontoxic. Contact with eyes causes mild irritation, and prolonged contact with skin may cause dermatitis.  
 3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None known.  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 398°F C.C.  
 4.2 **Flammable Limits in Air:** Not pertinent  
 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing; water may be ineffective.  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 4 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 0  
 Human Oral hazard: 0  
 Human Contact hazard: 0  
 Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** D  
 7.6 **Ship Type:** Data not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** Not applicable  
 9.3 **Boiling Point at 1 atm:** Not pertinent (very high)  
 9.4 **Freezing Point:** 86°F = 30°C = 303°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.908 at 60°C (liquid)  
 9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 30°C  
 9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 30°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** (est.) -15,500 Btu/lb = -8,600 cal/g = -360 X 10<sup>3</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

NOTES

# OILS, EDIBLE: TUCUM

OTC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
88	57.000	88	0.480	90	1.158		N O T  P E R T I N E N T
90	56.960	90	0.480	95	1.158		
92	56.910	92	0.480	100	1.158		
94	56.860	94	0.480	105	1.158		
96	56.810	96	0.480	110	1.158		
98	56.760	98	0.480	115	1.158		
100	56.710	100	0.480	120	1.158		
102	56.670	102	0.480				
104	56.620	104	0.480				
106	56.570	106	0.480				
108	56.520	108	0.480				
110	56.470	110	0.480				
112	56.420	112	0.480				
114	56.370	114	0.480				
116	56.330	116	0.480				
118	56.280	118	0.480				
120	56.230	120	0.480				
122	56.180	122	0.480				
124	56.130						
126	56.080						
128	56.030						
130	55.990						
132	55.940						
134	55.890						
136	55.840						
138	55.790						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# OILS, FUEL: 2-D

OTD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diesel oil, medium	Oily liquid	Yellow-brown	Lube or fuel oil odor
Floats on water.			
Keep people away. Avoid contact with liquid. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: 3.1/1270  
2.4 DOT ID No.: 1993  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 33440

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Protective gloves; goggles or face shield.  
3.2 Symptoms Following Exposure: INGESTION causes nausea, vomiting, and cramping; depression of central nervous system ranging from mild headache to anesthesia, coma, and death; pulmonary irritation secondary to exhalation of solvent; signs of kidney and liver damage may be delayed. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system excitement followed by depression.  
3.3 Treatment of Exposure: INGESTION: do NOT induce vomiting. ASPIRATION: enforce bed rest; administer oxygen; seek medical attention. EYES: wash with copious quantity of water. SKIN: remove solvent by wiping and wash with soap and water.  
3.4 TLV-TWA: Notice of intended change: 100 mg/m<sup>3</sup> (skin)  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 1; LD<sub>50</sub> = 5-15 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Slight smarting of eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 125°F C.C.  
4.2 Flammable Limits in Air: 1.3%-6.0%  
4.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 490-545°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: 4 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 204 mg/l/24 hr/juvenile American shad/TLW/salt water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Diesel fuel 2-D (ASTM)  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: 540-640°F = 282-338°C = 555-611°K  
9.4 Freezing Point: 0°F = 18°C = 255°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.87-0.90 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: -19,440 Btu/lb = -10,800 cal/g = -452.17 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# OILS, FUEL: 2-D

OTD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	54.310	0	0.414	35	0.908	0	3.773
52	54.310	5	0.416	40	0.908	10	3.397
54	54.310	10	0.419	45	0.908	20	3.071
56	54.310	15	0.421	50	0.908	30	2.788
58	54.310	20	0.424	55	0.908	40	2.541
60	54.310	25	0.426	60	0.908	50	2.324
62	54.310	30	0.428	65	0.908	60	2.134
64	54.310	35	0.431	70	0.908	70	1.965
66	54.310	40	0.433	75	0.908	80	1.815
68	54.310	45	0.436	80	0.908	90	1.681
70	54.310	50	0.438	85	0.908	100	1.561
72	54.310	55	0.440	90	0.908	110	1.454
74	54.310	60	0.443	95	0.908	120	1.358
76	54.310	65	0.445	100	0.908	130	1.270
78	54.310	70	0.448	105	0.908	140	1.191
80	54.310	75	0.450	110	0.908	150	1.120
82	54.310	80	0.452	115	0.908	160	1.054
84	54.310	85	0.455	120	0.908	170	0.995
		90	0.457	125	0.908	180	0.940
		95	0.460			190	0.890
		100	0.462			200	0.844
						210	0.802

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	55	0.456		N		N
	N	60	0.474		O		O
	S	65	0.492		T		T
	O	70	0.510				
	L	75	0.529		P		P
	U	80	0.548		E		E
	B	85	0.567		R		R
	I	90	0.587		T		T
	E	95	0.607		I		I
		100	0.627		N		N
		105	0.647		E		E
		110	0.668		N		N
		115	0.689		T		T
		120	0.711				
		125	0.732				
		130	0.754				



# 1-OCTENE

OTE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Caprylene alpha-Octylene	Liquid  Colorless  Gasoline-like odor  Floats on water. Flammable, harmful vapor is produced.
<b>Fire</b>  Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.  FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR If inhaled, will cause dizziness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $\text{CH}_2(\text{CH}_2)_7\text{CH}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 111-66-0  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Organic vapor canister; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Generally low toxicity. Mildly anesthetic at high vapor concentrations. May irritate eyes.  
3.3 **Treatment of Exposure:** INHALATION: remove from exposure; support respiration. INGESTION: do NOT induce vomiting.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present at high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 70°F O.C.  
4.2 **Flammable Limits in Air:** 0.9% (LEL)  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 493°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 6.5 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0.9% (theor.), 1 day  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Research: 99.7%; pure: 99.3%; technical: 95%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 112.22  
9.3 **Boiling Point at 1 atm:** 250.3°F = 121.3°C = 394.5°K  
9.4 **Freezing Point:** -151°F = -102°C = 172°K  
9.5 **Critical Temperature:** 560.1°F = 293.4°C = 566.6°K  
9.6 **Critical Pressure:** 400 psia = 27.2 atm = 2.76 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.715 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 21.76 dynes/cm = 0.02176 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.050  
9.12 **Latent Heat of Vaporization:** 129 Btu/lb = 71.9 cal/g =  $3.01 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -19,170 Btu/lb = -10,650 cal/g = -445.89  $\times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

NOTES

# 1-OCTENE

OTE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	45.470	0	0.483	0	1.153	40	0.567
50	45.180	10	0.487	5	1.143	50	0.530
60	44.890	20	0.491	10	1.133	60	0.497
70	44.610	30	0.495	15	1.123	70	0.467
80	44.320	40	0.499	20	1.113	80	0.440
90	44.030	50	0.503	25	1.103	90	0.415
100	43.740	60	0.507	30	1.092	100	0.393
110	43.450	70	0.511	35	1.082	110	0.372
120	43.170	80	0.515	40	1.072	120	0.353
130	42.880	90	0.519	45	1.062	130	0.336
140	42.590	100	0.524	50	1.052	140	0.320
150	42.300	110	0.528	55	1.042	150	0.306
160	42.010	120	0.532	60	1.032	160	0.292
170	41.730	130	0.536	65	1.022	170	0.280
180	41.440	140	0.540	70	1.012	180	0.268
190	41.150	150	0.544	75	1.002	190	0.257
200	40.860	160	0.548	80	0.992	200	0.247
210	40.580	170	0.552	85	0.982	210	0.238
		180	0.556	90	0.972		
		190	0.560	95	0.961		
		200	0.564	100	0.951		
		210	0.568	105	0.941		
				110	0.931		
				115	0.921		
				120	0.911		
				125	0.901		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	40	0.097	40	0.00204	0	0.334
	N	60	0.196	60	0.00394	25	0.349
	S	80	0.369	80	0.00715	50	0.364
	O	100	0.657	100	0.01227	75	0.378
	L	120	1.114	120	0.02009	100	0.392
	U	140	1.810	140	0.03155	125	0.406
	B	160	2.830	160	0.04775	150	0.420
	L	180	4.279	180	0.06994	175	0.434
	E	200	6.279	200	0.09951	200	0.448
		220	8.970	220	0.13800	225	0.461
		240	12.510	240	0.18690	250	0.474
		260	17.060	260	0.24790	275	0.487
		280	22.830	280	0.32260	300	0.500
		300	30.000	300	0.41280	325	0.513
		320	38.780	320	0.52000	350	0.525
		340	49.400	340	0.64580	375	0.537
		360	62.070	360	0.79160	400	0.550
		380	77.020	380	0.95900	425	0.561
						450	0.573
						475	0.585
						500	0.596
						525	0.608
						550	0.619
						575	0.630
						600	0.640

# OILS, MISCELLANEOUS: TRANSFORMER

OTF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Electrical insulating oil Insulating oil Petroleum insulating oil	Oily liquid Colorless to light brown Motor oil-like odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: 3.3/1270  
2.4 DOT ID No.: 1268  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification:  
32429

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Ingestion of liquid may irritate stomach and cause increased frequency of bowel movements. If taken into lungs, delayed pulmonary irritation may occur.  
3.3 **Treatment of Exposure:** INGESTION: do NOT induce vomiting. ASPIRATION: check for delayed irritation by serial X-rays. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 295°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Very high  
9.4 **Freezing Point:** -75°F = -59°C = 214°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.891 at 15°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** 49 dynes/cm = 0.049 N/m at 25°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, MISCELLANEOUS: TRANSFORMER

OTF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	55.560	50	0.463	65	0.790	100	10.250
52	55.560	52	0.463	70	0.790		
54	55.560	54	0.463	75	0.790		
56	55.560	56	0.463	80	0.790		
58	55.560	58	0.463	85	0.790		
60	55.560	60	0.463	90	0.790		
62	55.560	62	0.463	95	0.790		
64	55.560	64	0.463	100	0.790		
66	55.560	66	0.463	105	0.790		
68	55.560	68	0.463	110	0.790		
70	55.560	70	0.463	115	0.790		
72	55.560	72	0.463	120	0.790		
74	55.560	74	0.463	125	0.790		
76	55.560	76	0.463	130	0.790		
78	55.560	78	0.463	135	0.790		
80	55.560	80	0.463				
82	55.560	82	0.463				
84	55.560	84	0.463				
		86	0.463				
		88	0.463				
		90	0.463				
		92	0.463				
		94	0.463				
		96	0.463				
		98	0.463				
		100	0.463				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OILS, MISCELLANEOUS: TALL

OTL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Oily liquid  Yellow  Characteristic odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID. Exposure data not available. Flush affected areas with water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 29220

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Currently not available  
3.2 Symptoms Following Exposure: Currently not available  
3.3 Treatment of Exposure: Currently not available  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 380°F O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 0  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Various grades, which differ primarily in the relative content of fatty acids and rosin acids.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: B  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.951 at 16°C (liquid)  
9.8 Liquid Surface Tension: 34.3 dynes/cm = 0.0343 N/m at 24°C  
9.9 Liquid Water Interfacial Tension: 11 dynes/cm = 0.011 N/m at 22.5°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -18,000 = -10,000 cal/g = -420 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.1 psia

### NOTES

# OILS, MISCELLANEOUS: TALL

OTL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	60.870	85	0.493	35	0.920	100	42.000
40	60.580	90	0.493	40	0.919		
45	60.280	95	0.493	45	0.918		
50	59.990	100	0.493	50	0.917		
55	59.690	105	0.493	55	0.916		
60	59.400	110	0.493	60	0.915		
65	59.100	115	0.493	65	0.914		
70	58.810	120	0.493	70	0.913		
75	58.510	125	0.493	75	0.912		
80	58.220	130	0.493	80	0.911		
85	57.930	135	0.493	85	0.910		
90	57.630	140	0.493	90	0.909		
95	57.340	145	0.493	95	0.908		
100	57.040	150	0.493	100	0.907		
105	56.750			105	0.906		
110	56.450			110	0.905		
115	56.160			115	0.904		
120	55.860			120	0.903		
125	55.570						
130	55.270						
135	54.980						
140	54.680						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	0.042		N		N
	N	75	0.049		O		O
	S	80	0.057		T		T
	O	85	0.065				
	L	90	0.076		P		P
	U	95	0.087		E		E
	B	100	0.100		R		R
	L	105	0.114		T		T
	E	110	0.131		I		I
		115	0.149		N		N
		120	0.170		E		E
		125	0.193		N		N
		130	0.218		T		T
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				

# OILS, MISCELLANEOUS: TANNER'S

OTN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sulfated neatsfoot oil	
Oily liquid	
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID. Exposure data not available. Flush affected areas with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment:  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

**2.1 CG Compatibility Group:** 33;  
 Miscellaneous Hydrocarbon Mixtures  
**2.2 Formula:** Not applicable  
**2.3 IMO/UN Designation:** Not listed  
**2.4 DOT ID No.:** Not listed  
**2.5 CAS Registry No.:** Currently not available  
**2.6 NAERG Guide No.:** Not listed  
**2.7 Standard Industrial Trade Classification:**  
 41130

### 3. HEALTH HAZARDS

**3.1 Personal Protective Equipment:** Currently not available  
**3.2 Symptoms Following Exposure:** Currently not available  
**3.3 Treatment of Exposure:** Currently not available  
**3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Currently not available  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Currently not available  
**3.11 Liquid or Solid Characteristics:** Currently not available  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

**4.1 Flash Point:**  
 Currently not available  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Not pertinent  
**4.7 Auto Ignition Temperature:** Not pertinent  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent.  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

**5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

**6.1 Aquatic Toxicity:**  
 Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):**  
 Currently not available  
**6.4 Food Chain Concentration Potential:**  
 Currently not available  
**6.5 GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

**7.1 Grades of Purity:** Currently not available  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

**8.1 49 CFR Category:** Not listed  
**8.2 49 CFR Class:** Not pertinent  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

**9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** Not pertinent  
**9.3 Boiling Point at 1 atm:** Very high  
**9.4 Freezing Point:** Currently not available  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** (est.) 0.85 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):**  
 Not pertinent  
**9.12 Latent Heat of Vaporization:** Not pertinent  
**9.13 Heat of Combustion:** (est.) -18,000 Btu/lb = -10,000 cal/g = -420 10<sup>3</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, MISCELLANEOUS: TANNER'S

OTN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	53.060	85	0.543	35	0.920	50	9.343
52	53.060	90	0.555	40	0.919	52	8.841
54	53.060	95	0.567	45	0.918	54	8.370
56	53.060	100	0.579	50	0.917	56	7.927
58	53.060	105	0.591	55	0.916	58	7.511
60	53.060	110	0.603	60	0.915	60	7.119
62	53.060	115	0.615	65	0.914	62	6.751
64	53.060	120	0.627	70	0.913	64	6.404
66	53.060	125	0.640	75	0.912	66	6.078
68	53.060	130	0.652	80	0.911	68	5.770
70	53.060	135	0.664	85	0.910	70	5.481
72	53.060	140	0.676	90	0.909	72	5.207
74	53.060	145	0.688	95	0.908	74	4.950
76	53.060	150	0.700	100	0.907	76	4.707
78	53.060			105	0.906	78	4.477
80	53.060			110	0.905	80	4.260
82	53.060			115	0.904	82	4.056
84	53.060			120	0.903	84	3.862

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L I T Y	70	0.042		N O T		N O T
		75	0.049				
		80	0.057		P E R T I N E N T		P E R T I N E N T
		85	0.065				
		90	0.076				
		95	0.087				
		100	0.100				
		105	0.114				
		110	0.131				
		115	0.149				
		120	0.170				
		125	0.193				
		130	0.218				
		135	0.247				
		140	0.279				
		145	0.314				
		150	0.352				
		155	0.395				
		160	0.443				
		165	0.495				
		170	0.552				
		175	0.615				
		180	0.683				
		185	0.758				
		190	0.841				
		195	0.930				



# OILS, FUEL: 2

OTW

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Home-heating oil	Oily liquid	Yellow-brown	Lube or fuel oil odor
Floats on water.			
Keep people away. Avoid contact with liquid. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 33;  
     Miscellaneous Hydrocarbon Mixtures  
**2.2 Formula:** Not applicable  
**2.3 IMO/UN Designation:** 3.3/1223  
**2.4 DOT ID No.:** 1993  
**2.5 CAS Registry No.:** 68476-30-2  
**2.6 NAERG Guide No.:** 128  
**2.7 Standard Industrial Trade Classification:** 33440

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Protective gloves; goggles or face shield.  
**3.2 Symptoms Following Exposure:** INHALATION causes headache and slight giddiness. INGESTION causes nausea, vomiting, and cramping; depression of central nervous system ranging from mild headache to anesthesia, coma, and death; pulmonary irritation secondary to exhalation of solvent; signs of kidney and liver damage may be delayed. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system excitement followed by depression.  
**3.3 Treatment of Exposure:** INGESTION: do NOT induce vomiting. ASPIRATION: enforce bed rest; administer oxygen; seek medical attention. EYES: wash with copious quantity of water. SKIN: remove solvent by wiping and wash with soap and water.  
**3.4 TLV-TWA:** Notice of intended change: 100 mg/m<sup>3</sup> (skin)  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5-15 g/kg  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Slight smarting of eyes or respiratory system if present in high concentrations. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 136°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Not pertinent  
**4.7 Auto Ignition Temperature:** 494°F  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** 4 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent.  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
     200 ppm/24 hr/juvenile American  
     shad/TLW/fresh water  
     20 ppm/96 hr/rainbow trout eggs/TLW/salt  
     water  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Commercial  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester)  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid  
**8.2 49 CFR Class:** 3  
**8.3 49 CFR Package Group:** III  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  
     Category                      Classification  
     Health Hazard (Blue)..... 0  
     Flammability (Red)..... 2  
     Instability (Yellow)..... 0  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** Not pertinent  
**9.3 Boiling Point at 1 atm:** 540–640°F = 282–338°C = 555–611°K  
**9.4 Freezing Point:** –20°F = –29°C = 244°K  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 0.879 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
**9.12 Latent Heat of Vaporization:** Not pertinent  
**9.13 Heat of Combustion:** –19,440 Btu/lb = –10,800 cal/g = –452.17 X 10<sup>3</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# OILS, FUEL: 2

OTW

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	54.740	30	0.429	30	0.908	0	3.773
52	54.740	35	0.431	35	0.908	10	3.397
54	54.740	40	0.434	40	0.908	20	3.071
56	54.740	45	0.436	45	0.908	30	2.788
58	54.740	50	0.439	50	0.908	40	2.541
60	54.740	55	0.441	55	0.908	50	2.324
62	54.740	60	0.443	60	0.908	60	2.134
64	54.740	65	0.446	65	0.908	70	1.965
66	54.740	70	0.448	70	0.908	80	1.815
68	54.740	75	0.451	75	0.908	90	1.681
70	54.740	80	0.453	80	0.908	100	1.561
72	54.740	85	0.456	85	0.908	110	1.454
74	54.740	90	0.458	90	0.908	120	1.358
76	54.740	95	0.460	95	0.908	130	1.270
78	54.740	100	0.463	100	0.908	140	1.191
80	54.740	105	0.465	105	0.908	150	1.120
82	54.740	110	0.468	110	0.908	160	1.054
84	54.740	115	0.470	115	0.908	170	0.995
		120	0.472	120	0.908	180	0.940
		125	0.475	125	0.908	190	0.890
		130	0.477	130	0.908	200	0.844
						210	0.802

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	55	0.466		N		N
	N	60	0.474		O		O
	S	65	0.481		T		T
	O	70	0.489				
	L	75	0.497		P		P
	U	80	0.505		E		E
	B	85	0.512		R		R
	I	90	0.520		T		T
	E	95	0.528		I		I
		100	0.535		N		N
		105	0.543		E		E
		110	0.550		N		N
		115	0.558		T		T
		120	0.565				
		125	0.573				
		130	0.580				

# OILS, EDIBLE: VEGETABLE

OVG

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Oily liquid      Pale yellow      Weak, fatty odor

Floats on water.

Call fire department.  
Notify local health and pollution control agencies.

### Fire

Combustible.  
Extinguish with dry chemical, foam or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

Not harmful.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula: Not applicable  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 42000

## 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield.  
3.2 Symptoms Following Exposure: None-is a food.  
3.3 Treatment of Exposure: EYES: flush with water for at least 15 min.  
3.4 TLV-TWA: 10 mg/m<sup>3</sup> (mist)  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: None  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: None  
3.11 Liquid or Solid Characteristics: None  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: 15 mg/m<sup>3</sup> (total dust); 5 mg/m<sup>3</sup> (respirable fraction)  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

4.1 Flash Point: 610°F O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: (1)  
Human Contact hazard: I  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.923 at 25°C (liquid)  
9.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -16,000 Btu/lb = -8,870 cal/g = -371 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

NOTES

# OILS, EDIBLE: VEGETABLE

OVG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	58.050	35	0.478	50	1.179	50	3909.000
52	57.980	40	0.478	60	1.179	55	3027.000
54	57.910	45	0.478	70	1.179	60	2356.000
56	57.840	50	0.478	80	1.179	65	1842.000
58	57.780	55	0.478	90	1.179	70	1448.000
60	57.710	60	0.478	100	1.179	75	1142.000
62	57.640	65	0.478	110	1.179	80	905.500
64	57.570	70	0.478	120	1.179	85	720.799
66	57.500	75	0.478	130	1.179	90	576.199
68	57.430	80	0.478	140	1.179	95	462.399
70	57.360	85	0.478	150	1.179	100	372.599
72	57.290	90	0.478	160	1.179	105	301.399
74	57.220	95	0.478	170	1.179	110	244.699
76	57.150	100	0.478	180	1.179	115	199.299
78	57.080			190	1.179	120	163.000
80	57.010			200	1.179	125	133.699
82	56.940			210	1.179	130	110.099
84	56.870					135	90.940
86	56.800						
88	56.730						
90	56.670						
92	56.600						
94	56.530						
96	56.460						
98	56.390						
100	56.320						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	35	0.013		N		N
	N	40	0.016		O		O
	S	45	0.018		T		T
	O	50	0.022				
	L	55	0.026		P		P
	U	60	0.030		E		E
	B	65	0.035		R		R
	L	70	0.041		T		T
	E	75	0.048		I		I
		80	0.056		N		N
		85	0.065		E		E
		90	0.075		N		N
		95	0.086		T		T
		100	0.099				
		105	0.113				
		110	0.129				
		115	0.147				
		120	0.168				

# OXALIC ACID

OXA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethanedioic acid	Solid crystals	White	Odorless
Sinks and mixes with water.			
Keep people away. Avoid contact with solid and dust. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. Poisonous gases are produced in fire. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Will burn eyes, nose and throat. If inhaled, will cause difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. If swallowed, will cause nausea or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge  
Chemical and Physical Treatment: Burn;  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>2</sub>H<sub>2</sub>O<sub>4</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 144-62-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respirator for dust or mist protection; rubber, neoprene, or vinyl gloves; chemical safety glasses; rubbers, over leather or rubber safety shoes; apron or impervious clothing for splash protection.
- 3.2 **Symptoms Following Exposure:** As dust or as a solution, can cause severe burns of eyes, skin, or mucous membranes. Ingestion of 5 grams has caused death with symptoms of nausea, shock, collapse, and convulsions coming on rapidly. Repeated or prolonged skin exposure can cause dermatitis and slow-healing ulcers.
- 3.3 **Treatment of Exposure:** Get medical attention for all eye exposures and any serious overexposures; treatment is symptomatic. INHALATION: rinse mouth and/or gargle repeatedly with cold water. INGESTION: dilute by drinking large amounts of water; repeat at least once and then administer milk or milk of magnesia as an emollient; do NOT induce vomiting. EYES AND SKIN: flush thoroughly with water.
- 3.4 TLV-TWA: 1 mg/m<sup>3</sup>  
3.5 TLV-STEL: 2 mg/m<sup>3</sup>  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: 500 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 1 mg/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Generates poisonous gases  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Not flammable  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not flammable  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Lime or soda ash  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 4000 mg/l/24 hr/bluegill/TL<sub>m</sub>/fresh water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 14%, 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical: 99.8% min.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	1 2
Flammability (Red).....	1 1
Instability (Yellow).....	0 0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 126.07  
9.3 Boiling Point at 1 atm: Decomposes  
9.4 Freezing Point: 214.7°F = 101.5°C = 374.7°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.90 at 15°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# OXALIC ACID

OXA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	3.896		N O T		N O T		N O T
36	4.296						
38	4.696						
40	5.096						
42	5.496		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	5.896						
46	6.296						
48	6.696						
50	7.096						
52	7.496						
54	7.896						
56	8.296						
58	8.696						
60	9.096						
62	9.496						
64	9.896						
66	10.300						
68	10.700						
70	11.100						
72	11.500						
74	11.900						
76	12.300						
78	12.700						
80	13.100						
82	13.500						
84	13.900						

# OXYGEN

OXY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Liquid oxygen LOX	Gas	Light blue	Odorless
	Sinks and boils in water.		
Evacuate. Keep people away. Avoid contact with liquid and vapor. Wear rubber overclothing (including gloves). Shut off ignition sources and call fire department.			
<b>Fire</b>	Not flammable. Containers may explode in fire. Cool exposed containers with water.		
<b>Exposure</b>	Call for medical aid.		
	VAPOR If inhaled will cause dizziness, or difficult breathing.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.		
<b>Water Pollution</b>	Not harmful to aquatic life.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: O<sub>2</sub>
- 2.3 IMO/UN Designation: 2/1073
- 2.4 DOT ID No.: 1072
- 2.5 CAS Registry No.: 7782-44-7
- 2.6 NAERG Guide No.: 122
- 2.7 Standard Industrial Trade Classification: 52221

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety goggles or face shield; insulated gloves; long sleeves; trousers worn outside boots or over high-top shoes to shed spilled liquid.
- 3.2 **Symptoms Following Exposure:** Inhalation of 100% oxygen can cause nausea, dizziness, irritation of lungs, pulmonary edema, pneumonia, and collapse. Liquid may cause frostbite of eyes and skin.
- 3.3 **Treatment of Exposure:** INHALATION: in all but the most severe cases (pneumonia), recovery is rapid after reduction of oxygen pressure; supportive treatment should include immediate sedation, anticonvulsive therapy if needed, and rest. EYES: treat frostbite burns. SKIN: treat frostbite; soak in lukewarm water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Not pertinent
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable but supports combustion
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Increases intensity of any fire. Mixtures of liquid oxygen and any fuel are highly explosive.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Heat of water will vigorously vaporize liquid oxygen.
- 5.2 **Reactivity with Common Materials:**  
Avoid organic and combustible materials, such as oil, grease, coal dust, etc. If ignited, such mixtures can explode. The low temperature may cause brittleness in some materials.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.5+%
- 7.2 **Storage Temperature:** -183°C
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Nonflammable gas
- 8.2 **49 CFR Class:** 2.2
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0
Special (White).....	OX
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 32.0
- 9.3 **Boiling Point at 1 atm:** -297.3°F = -182.9°C = 90.3°K
- 9.4 **Freezing Point:** -361°F = -218°C = 55°K
- 9.5 **Critical Temperature:** -180°F = -118°C = 155°K
- 9.6 **Critical Pressure:** 738 psia = 50.1 atm = 5.09 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 1.14 at -183°C (liquid)
- 9.8 **Liquid Surface Tension:** 13.47 dynes/cm = 0.01347 N/m at -183°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 1.1
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.3962
- 9.12 **Latent Heat of Vaporization:** 91.6 Btu/lb = 50.9 cal/g = 2.13 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Very high

### NOTES

# OXYGEN

OXY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-295	70.660	-309	0.406	-308	1.040	-305	0.209
-290	69.509	-308	0.406	-306	1.040	-300	0.195
-285	68.370	-307	0.406	-304	1.040	-295	0.183
-280	67.219	-306	0.406	-302	1.040	-290	0.172
-275	66.080	-305	0.406	-300	1.040	-285	0.163
-270	64.929	-304	0.406	-298	1.040	-280	0.154
-265	63.790	-303	0.406	-296	1.040	-275	0.147
-260	62.650	-302	0.406	-294	1.040	-270	0.140
-255	61.500	-301	0.406	-292	1.040	-265	0.134
-250	60.360	-300	0.406	-290	1.040	-260	0.128
-245	59.210	-299	0.406	-288	1.040	-255	0.123
-240	58.070	-298	0.406	-286	1.040	-250	0.118
-235	56.920	-297	0.406	-284	1.040	-245	0.114
-230	55.780	-296	0.406	-282	1.040	-240	0.110
-225	54.630	-295	0.406	-280	1.040		
-220	53.490	-294	0.406	-278	1.040		
-215	52.350	-293	0.406	-276	1.040		
-210	51.200	-292	0.406	-274	1.040		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		-293	18.360	-293	0.32840	0	0.219
		-292	19.420	-292	0.34530	10	0.219
		-291	20.530	-291	0.36280	20	0.219
		-290	21.680	-290	0.38100	30	0.219
		-289	22.890	-289	0.39980	40	0.219
		-288	24.150	-288	0.41930	50	0.219
		-287	25.460	-287	0.43850	60	0.219
		-286	26.820	-286	0.46040	70	0.219
		-285	28.250	-285	0.48210	80	0.219
		-284	29.730	-284	0.50440	90	0.219
		-283	31.270	-283	0.52760	100	0.219
		-282	32.870	-282	0.55150	110	0.219
		-281	34.530	-281	0.57610	120	0.219
		-280	36.260	-280	0.60160	130	0.219
						140	0.219
						150	0.219
						160	0.219
						170	0.219
						180	0.219
						190	0.219
						200	0.219
						210	0.219
						220	0.219
						230	0.219
						240	0.219
						250	0.219



# PERACETIC ACID

PAA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetyl hydroperoxide Peroxyacetic acid	Liquid  Colorless  Strong odor  Mixes with water. Flammable, irritating vapor is produced.
Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. May cause fire on contact with combustibles. Containers may explode in fire. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{COOOH}-\text{CH}_3\text{COOH}$   
2.3 IMO/UN Designation: 5.2/2131  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 79-21-0  
2.6 NAERG Guide No.: 141  
2.7 Standard Industrial Trade Classification: 51396

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; full protective clothing (goggles, rubber gloves, etc.)  
3.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of mucous membrane. Contact with liquid causes severe irritation of eyes and skin. Ingestion causes severe distress, including burns of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if he is not breathing, apply artificial respiration and oxygen; call a doctor. EYES: flush with water for at least 15 min.; call a doctor. SKIN: flush with water and treat burns. INGESTION: give plenty of warm water; call a doctor.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; oral  $\text{LD}_{50} = 10 \text{ mg/kg}$  (guinea pig)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 104°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Vapors are very flammable and explosive. Liquid will detonate if concentration rises above 56% because of evaporation of acetic acid.  
4.7 **Auto Ignition Temperature:** 392°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 16.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May cause fire in contact with organic materials such as wood, cotton or straw. Corrosive to most metals, including aluminum.  
5.3 **Stability During Transport:** Stable if kept cool and out of contact with most metals. At 30°C concentration decreases about 0.4% each month.  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 40% peracetic acid, 40% acetic acid, 5% hydrogen peroxide, 13% water, 500 ppm stabilizer  
7.2 **Storage Temperature:** 60°F–122°F  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	4
Special (White).....	OX

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Not pertinent (mixture)  
9.4 **Freezing Point:** (approx.)\* -22°F = -30°C = 243°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) 1.153 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available \*40% solution in acetic acid/H<sub>2</sub>O

### NOTES

# PERACETIC ACID

PAA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
76	71.790		N O T  P E R T I N E N T		N O T  P E R T I N E N T	52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86	4.728 4.591 4.459 4.331 4.208 4.090 3.976 3.865 3.759 3.656 3.557 3.461 3.369 3.280 3.193 3.110 3.029 2.951

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210	0.197 0.276 0.382 0.523 0.707 0.946 1.252 1.643 2.136 2.752 3.518 4.462 5.618 7.023 8.720 10.760		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# PHOSPHORIC ACID

PAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Orthophosphoric acid	Thick liquid Colorless Odorless  Sinks and mixes with water
Keep people away. <b>AVOID CONTACT WITH LIQUID.</b> Wear chemical protective suit. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Flammable gas is formed on contact with metals. Wear chemical protective suit with self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 1; Non-oxidizing mineral acid  
2.2 **Formula:** H<sub>3</sub>PO<sub>4</sub>  
2.3 **IMO/UN Designation:** 9.0/1805  
2.4 **DOT ID No.:** 1805  
2.5 **CAS Registry No.:** 7664-38-2  
2.6 **NAERG Guide No.:** 154  
2.7 **Standard Industrial Trade Classification:** 52234

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves and protective clothing.  
3.2 **Symptoms Following Exposure:** Burns on mouth and lips, sour acid taste, severe gastrointestinal irritation, nausea, vomiting, bloody diarrhea, difficult swallowing, severe abdominal pains, thirst, acidemia, difficult breathing, convulsions, collapse, shock, death.  
3.3 **Treatment of Exposure:** INGESTION: do NOT induce vomiting; give water, milk, or vegetable oil. SKIN OR EYE CONTACT: flush with water for at least 15 min.  
3.4 **TLV-TWA:** 1.0 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** 3 mg/m<sup>3</sup>  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Not volatile.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second- degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 1,000 mg/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 1 mg/m<sup>3</sup>  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Mild evolution of heat.  
5.2 **Reactivity with Common Materials:**  
Reacts with metals to liberate flammable hydrogen gas.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, neutralize with lime.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
138 ppm/24 hr/mosquito fish/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** NF, food, fertilizer, commercial; all 75-85%, the balance being water.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 98.00  
9.3 **Boiling Point at 1 atm:** >266°F = >130°C = >403°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.892 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -52 Btu/lb = -29 cal/g = -1.2 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 25.8 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

### NOTES

# PHOSPHORIC ACID

PAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
80	117.700	68	0.178		N		N
90	117.400	69	0.178		O		O
100	117.099	70	0.178		T		T
110	116.799	71	0.178				
120	116.500	72	0.178		P		P
130	116.200	73	0.178		E		E
140	115.900	74	0.178		R		R
150	115.599	75	0.178		T		T
160	115.299	76	0.178		I		I
170	115.000	77	0.178		N		N
180	114.700	78	0.178		E		E
190	114.400	79	0.178		N		N
200	114.099	80	0.178		T		T
210	113.799	81	0.178				
220	113.500	82	0.178				
230	113.200	83	0.178				
240	112.900	84	0.178				
250	112.700	85	0.178				
260	112.400						
270	112.099						
280	111.799						
290	111.500						
300	111.200						
310	110.900						
320	110.599						
330	110.299						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# PROPIONALDEHYDE

PAD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methyl acetaldehyde Propanal Propionic aldehyde Propyl aldehyde Propylic aldehyde	Liquid  Colorless  Suffocating, unpleasant odor  Floats and mixes slowly with water. Flammable, irritating vapor is produced.
<b>Fire</b> FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, alcohol foam, carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea or vomiting. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Skim  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 19; Aldehyde  
2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CHO}$   
2.3 IMO/UN Designation: 3.2/1275  
2.4 DOT ID No.: 1275  
2.5 CAS Registry No.: 123-38-6  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask for high vapor concentrations; plastic gloves; goggles.
- 3.2 **Symptoms Following Exposure:** Vapors will irritate nose and throat, and may cause nausea and vomiting. Liquid causes eye irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give oxygen if breathing is difficult; call a physician. EYES: flush with plenty of water for at least 15 min., and call a physician. SKIN: flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation, such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 1 ppm
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  $-22^\circ\text{F}$  O.C.
- 4.2 **Flammable Limits in Air:** 2.6%-16.1%
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires, alcohol-type foam for large fires.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:**  $405^\circ\text{F}$
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 4.4 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 19.0 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** May occur in presence of acids or caustics.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 95% of theoretical in 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97-99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester) or pressure-vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at  $15^\circ\text{C}$  and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 58.08
- 9.3 **Boiling Point at 1 atm:**  $118.4^\circ\text{F} = 48.0^\circ\text{C} = 321.2^\circ\text{K}$
- 9.4 **Freezing Point:**  $-112^\circ\text{F} = -80^\circ\text{C} = 193^\circ\text{K}$
- 9.5 **Critical Temperature:**  $433.4^\circ\text{F} = 223^\circ\text{C} = 496.2^\circ\text{K}$
- 9.6 **Critical Pressure:** 690 psia = 47 atm = 4.8 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.805 at  $20^\circ\text{C}$  (liquid)
- 9.8 **Liquid Surface Tension:** 23.4 dynes/cm = 0.0234 N/m at  $20^\circ\text{C}$
- 9.9 **Liquid Water Interfacial Tension:** 29 dynes/cm = 0.029 N/m at  $22.7^\circ\text{C}$
- 9.10 **Vapor (Gas) Specific Gravity:** 2.0
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.120
- 9.12 **Latent Heat of Vaporization:** 211 Btu/lb = 117 cal/g =  $4.9 \times 10^5$  J/kg
- 9.13 **Heat of Combustion:**  $-12,470$  Btu/lb =  $-6930$  cal/g =  $-290.1 \times 10^5$  J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.)  $-9$  Btu/lb =  $-5$  cal/g =  $0.2 \times 10^5$  J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 6.7 psia

### NOTES

# PROPIONALDEHYDE

PAD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-20	53.670	0	0.502	70	1.121	35	0.456
-15	53.480	5	0.504	75	1.114	40	0.440
-10	53.290	10	0.506	80	1.106	45	0.425
-5	53.100	15	0.508	85	1.099	50	0.410
0	52.910	20	0.510	90	1.091	55	0.396
5	52.720	25	0.512	95	1.084	60	0.383
10	52.530	30	0.514	100	1.077	65	0.371
15	52.330	35	0.516	105	1.069	70	0.359
20	52.141	40	0.518	110	1.062	75	0.348
25	51.950	45	0.520	115	1.054	80	0.337
30	51.760	50	0.522			85	0.327
35	51.570	55	0.525			90	0.318
40	51.380	60	0.527			95	0.308
45	51.190	65	0.529			100	0.300
50	51.000	70	0.531			105	0.291
55	50.810	75	0.533			110	0.283
60	50.620	80	0.535			115	0.276
65	50.430	85	0.537				
70	50.240	90	0.539				
75	50.050	95	0.541				
80	49.850	100	0.543				
85	49.660	105	0.545				
90	49.470	110	0.547				
95	49.280	115	0.550				
100	49.090						
105	48.900						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	21.000	-30	0.250	-30	0.00315	0	0.290
		-20	0.366	-20	0.00450	25	0.301
		-10	0.524	-10	0.00630	50	0.312
		0	0.736	0	0.00866	75	0.323
		10	1.016	10	0.01171	100	0.333
		20	1.381	20	0.01558	125	0.344
		30	1.849	30	0.02043	150	0.354
		40	2.440	40	0.02643	175	0.364
		50	3.180	50	0.03376	200	0.374
		60	4.095	60	0.04264	225	0.384
		70	5.214	70	0.05326	250	0.394
		80	6.570	80	0.06587	275	0.403
		90	8.197	90	0.08068	300	0.413
		100	10.130	100	0.09796	325	0.422
		110	12.420	110	0.11790	350	0.431
		120	15.100	120	0.14090	375	0.440
		130	18.210	130	0.16710	400	0.449
		140	21.810	140	0.19680	425	0.458
		150	25.940	150	0.23020	450	0.466
		160	30.660	160	0.26770	475	0.475
		170	36.020	170	0.30950	500	0.483
						525	0.491
						550	0.499
						575	0.507
						600	0.515

# PROPIONIC ANHYDRIDE

PAH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methylacetic anhydride Propanoic anhydride Propionyl oxide	Liquid	Colorless	Sharp odor
Sinks and mixes slowly with water.			
Keep people away. Avoid contact with liquid. Wear rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, alcohol foam, or carbon dioxide.		
<b>Exposure</b>	Call for medical aid.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Chemical and Physical Treatment: Burn  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 11; Organic anhydride  
2.2 **Formula:** (CH<sub>3</sub>CH<sub>2</sub>CO)<sub>2</sub>O  
2.3 **IMO/UN Designation:** 8/2496  
2.4 **DOT ID No.:** 2496  
2.5 **CAS Registry No.:** 123-62-6  
2.6 **NAERG Guide No.:** 156  
2.7 **Standard Industrial Trade Classification:** 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister mask; goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of eyes and respiratory tract. Contact with liquid causes burns of eyes and skin. Ingestion causes burns of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air; if breathing has stopped, give artificial respiration. EYES: immediately flush with plenty of water for at least 15 min.; get medical attention. SKIN: immediately flush with plenty of water for at least 15 min. INGESTION: give large amount of water, do NOT induce vomiting.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg; Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 156°F O.C. 145°F C.C.  
4.2 **Flammable Limits in Air:** 1.48%-11.9%  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, alcohol foam, carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 545°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 3.0 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly to form weak propionic acid; the reaction is not hazardous.  
5.2 **Reactivity with Common Materials:** Slowly corrosive if wet  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 50 ppm/48 hr/water fleas/TL<sub>50</sub>/fresh water  
188 ppm/24 hr/bluegill/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 1.3 lb/lb, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Hazard Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 130.14  
9.3 **Boiling Point at 1 atm:** 336°F = 169°C = 442°K  
9.4 **Freezing Point:** -45°F = -43°C = 230°K  
9.5 **Critical Temperature:** 660.2°F = 349°C = 622.2°K  
9.6 **Critical Pressure:** 490 psia = 33 atm = 3.3 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.01 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 30 dynes/cm = 0.030 N/m at 25°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 4.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0543  
9.12 **Latent Heat of Vaporization:** 149 Btu/lb = 83 cal/g = 3.5 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (at 15°C) -10,320 Btu/lb = -5,740 cal/g = -240 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -36 Btu/lb = -20 cal/g = -0.84 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

### NOTES

# PROPIONIC ANHYDRIDE

PAH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	63.990	40	0.418	40	0.917	40	1.431
50	63.610	50	0.421	50	0.915	50	1.306
60	63.230	60	0.424	60	0.913	60	1.196
70	62.840	70	0.427	70	0.911	70	1.099
80	62.460	80	0.429	80	0.909	80	1.014
90	62.080	90	0.432	90	0.907	90	0.937
100	61.700	100	0.435	100	0.905	100	0.869
110	61.320	110	0.438	110	0.903	110	0.808
120	60.940	120	0.440	120	0.901	120	0.753
130	60.560	130	0.443	130	0.899	130	0.704
140	60.170	140	0.446	140	0.897	140	0.659
150	59.790	150	0.449	150	0.895	150	0.618
160	59.410	160	0.452	160	0.893	160	0.582
170	59.030	170	0.454	170	0.891	170	0.548
180	58.650	180	0.457	180	0.889	180	0.517
190	58.270	190	0.460	190	0.887	190	0.489
200	57.890	200	0.463	200	0.884	200	0.463
210	57.500	210	0.465	210	0.882	210	0.440

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L I T Y  R E A C T I V I T Y  S L O W L		70	0.025	70	0.00056	0	0.275
		80	0.035	80	0.00079	25	0.283
		90	0.049	90	0.00109	50	0.291
		100	0.069	100	0.00148	75	0.299
		110	0.094	110	0.00200	100	0.306
		120	0.128	120	0.00267	125	0.314
		130	0.172	130	0.00354	150	0.322
		140	0.229	140	0.00463	175	0.330
		150	0.302	150	0.00600	200	0.338
		160	0.395	160	0.00772	225	0.346
		170	0.512	170	0.00985	250	0.354
		180	0.658	180	0.01247	275	0.362
		190	0.840	190	0.01566	300	0.369
		200	1.063	200	0.01953	325	0.377
		210	1.337	210	0.02420	350	0.385
		220	1.670	220	0.02978	375	0.393
		230	2.072	230	0.03642	400	0.401
		240	2.556	240	0.04428	425	0.409
		250	3.134	250	0.05352	450	0.417
		260	3.821	260	0.06434	475	0.424
		270	4.633	270	0.07695	500	0.432
		280	5.588	280	0.09157	525	0.440
		290	6.707	290	0.10840	550	0.448
		300	8.012	300	0.12780	575	0.456
		310	9.526	310	0.15000	600	0.464
		320	11.280	320	0.17530		



# N-PROPYL ALCOHOL

PAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethylcarbinol 1-Propanol Propyl alcohol	Liquid  Colorless  Alcohol odor  Mixes with water. Flammable, irritating vapor is produced.
<b>Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause nausea, dizziness, or headache. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$   
2.3 IMO/UN Designation: 3.2/1274  
2.4 DOT ID No.: 1274  
2.5 CAS Registry No.: 71-23-8  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51212

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied respirator for high concentrations; goggles or face shield; plastic gloves.  
3.2 **Symptoms Following Exposure:** Contact with eyes is extremely irritating and may cause burns. Vapors irritate nose and throat. In high concentrations, may cause nausea, dizziness, headache, and stupor.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; call a physician. SKIN OR EYE CONTACT: flush at once with plenty of water; get medical care for eyes.  
3.4 TLV-TWA: 200 ppm  
3.5 TLV-STEL: 250 ppm  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** 30 ppm  
3.13 IDLH Value: 800 ppm.  
3.14 OSHA PEL-TWA: 200 ppm.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 81°F O.C. 77°F C.C.  
4.2 Flammable Limits in Air: 2.1%-13.5%  
4.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires; alcohol foam for large fires.  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 700°F  
4.8 Electrical Hazards: Class I, Group D  
4.9 Burning Rate: 2.9 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 21.4 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 7.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 500 ppm/24 hr/goldfish/died/fresh water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 0.47-1.5 lb/lb, 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99.8+%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 60.10  
9.3 Boiling Point at 1 atm: 207.0°F = 97.2°C = 370.4°K  
9.4 Freezing Point: -195.2°F = -126.2°C = 147.0°K  
9.5 Critical Temperature: 506.5°F = 263.6°C = 536.8°K  
9.6 Critical Pressure: 750 psia = 51 atm = 5.2 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.803 at 20°C (liquid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 2.1  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.107  
9.12 Latent Heat of Vaporization: 292.7 Btu/lb = 162.6 cal/g = 6.808 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -13,130 Btu/lb = -7296 cal/g = -305.5 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 20.66 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 0.87 psia

### NOTES

# N-PROPYL ALCOHOL

PAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	51.100	20	0.505		N		N
40	50.960	30	0.517		O		O
45	50.820	40	0.530		T		T
50	50.670	50	0.542				
55	50.530	60	0.554		P		P
60	50.390	70	0.566		E		E
65	50.250	80	0.579		R		R
70	50.110	90	0.591		T		T
75	49.960	100	0.603		I		I
80	49.820	110	0.615		N		N
85	49.680	120	0.627		E		E
90	49.540	130	0.640		N		N
95	49.400	140	0.652		T		T
100	49.250	150	0.664				
105	49.110	160	0.676				
110	48.970	170	0.689				
115	48.830						
120	48.680						
125	48.540						
130	48.400						
135	48.260						
140	48.120						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	0	0.014	0	0.00017	0	0.310
	I	5	0.017	5	0.00021	25	0.322
	S	10	0.022	10	0.00026	50	0.333
	C	15	0.028	15	0.00033	75	0.345
	I	20	0.035	20	0.00041	100	0.357
	B	25	0.043	25	0.00050	125	0.369
	L	30	0.054	30	0.00061	150	0.380
	E	35	0.066	35	0.00075	175	0.392
		40	0.082	40	0.00091	200	0.403
		45	0.100	45	0.00111	225	0.414
		50	0.122	50	0.00134	250	0.426
		55	0.148	55	0.00161	275	0.437
		60	0.179	60	0.00193	300	0.448
		65	0.216	65	0.00231	325	0.459
		70	0.260	70	0.00275	350	0.469
		75	0.311	75	0.00326	375	0.480
		80	0.372	80	0.00386	400	0.491
		85	0.442	85	0.00455	425	0.501
		90	0.525	90	0.00535	450	0.512
		95	0.621	95	0.00627	475	0.522
		100	0.732	100	0.00732	500	0.532
		105	0.861	105	0.00853	525	0.542
		110	1.009	110	0.00992	550	0.552
		115	1.180	115	0.01149	575	0.562
		120	1.376	120	0.01329	600	0.572
		125	1.600	125	0.01532		

# 2-PROPANOLAMINE

PAM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Alaninol 2-Amino-1-propanol 1-Methyl-2-hydroxyethylamine 1-Propanol, 2-amino-	Liquid  Colorless to pale yellow  Fishy odor  Liquid floats and mixes with water.
<b>Keep people away. Avoid contact with liquid or vapor. Wear self-contained breathing apparatus and full protective clothing for emergency action. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible TOXIC FUMES PRODUCED AT DECOMPOSITION TEMPERATURE. Wear self-contained breathing apparatus and full protective clothing. Small fires: Dry chemical, CO <sub>2</sub> , water spray, or foam. Large fires: Water spray, fog, or foam. Cool exposed containers with water until well after fire is out.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to eyes and skin. May cause burns. Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Remove and isolate contaminated clothing and shoes. IF IN EYES, hold eyelids open and flush with plenty of running water for at least 15 minutes. Flush other affected areas for at least 15 minutes with plenty of running water. Keep victim quiet and maintain normal body temperature.  VAPOR May be harmful if inhaled.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 8; Alkanolamines
- 2.2 Formula: CH<sub>3</sub>CH(NH<sub>2</sub>)CH<sub>2</sub>OH
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 78-91-1
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51461

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear butyl rubber gloves and face shield or all-purpose canister respirator for spills. Wear self-contained breathing apparatus and full protective clothing for fires.
- 3.2 **Symptoms Following Exposure:** If inhaled may be harmful. Contact may cause burns to skin and eyes. (Organic base.)
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. SKIN AND EYES: Immediately flush skin or eyes with running water for at least 15 minutes; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes. Maintain normal body temperature.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** May burn skin and eyes.
- 3.11 **Liquid or Solid Characteristics:** Liquid may burn skin and eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 145°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: Dry chemical, CO<sub>2</sub>, water spray or alcohol foam. Large fires: Water spray, fog or alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.
- 4.6 **Behavior in Fire:** May produce toxic oxides of nitrogen.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 27.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Cover spilled material with sodium bisulfate. Flush with water.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 75.11
- 9.3 **Boiling Point at 1 atm:** 311-317°F = 173-176°C = 446-449°K
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.943 at 20°C (dl mixture)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 2.59 (approximated)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2-PROPANOLAMINE

PAM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# PHTHALIC ANHYDRIDE

PAN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Benzenedicarboxylic acid anhydride 1,3-Dioxophthalan PAN Phthalandione Phthalic acid anhydride	Solid flakes or liquid (heated)      Colorless or pale yellow      Choking odor  Solid sinks in water, liquid solidifies and sinks in water.
<b>Keep people away.</b> <b>Avoid contact with liquid.</b> <b>Wear rubber overclothing (including gloves).</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose, and throat. If inhaled, with cause coughing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID Will burn skin or eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 <b>CG Compatibility Group:</b> 11; Organic anhydride 2.2 <b>Formula:</b> C <sub>8</sub> H <sub>4</sub> (CO) <sub>2</sub> O 2.3 <b>IMO/UN Designation:</b> Not listed 2.4 <b>DOT ID No.:</b> 2214 2.5 <b>CAS Registry No.:</b> 85-44-9 2.6 <b>NAERG Guide No.:</b> 156 2.7 <b>Standard Industrial Trade Classification:</b> 51382
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Coveralls and/or rubber apron; rubber shoes or boots; chemical goggles and/or face shield; Bureau of Mines organic vapor respirator (Type AB); gauntlet-type leather or rubber gloves. 3.2 <b>Symptoms Following Exposure:</b> Solid irritates skin and eyes, causing coughing and sneezing. Liquid causes severe thermal burns. 3.3 <b>Treatment of Exposure:</b> INHALATION: gargle with water and use a sedative cough mixture. INGESTION: induce vomiting and give water, milk, or vegetable oil. SKIN OR EYE CONTACT: Flush with water for at least 15 min.; if burned by molten material, remove as much solid as possible, soak off the remainder in cold water, and then treat the burn. 3.4 <b>TLV-TWA:</b> 1 ppm 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 3.11 <b>Liquid or Solid Characteristics:</b> Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure. 3.12 <b>Odor Threshold:</b> 0.32-0.72 mg/m <sup>3</sup> 3.13 <b>IDLH Value:</b> 60 mg/m <sup>3</sup> 3.14 <b>OSHA PEL-TWA:</b> 2 ppm 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 329°F O.C. 305°F C.C.  
4.2 **Flammable Limits in Air:** 1.7%-10.5%  
4.3 **Fire Extinguishing Agents:** Water fog, dry chemical, carbon dioxide, or foam  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 1058°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Solid has very slow reaction; no hazard. Liquid spatters when in contact with water.  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Water and sodium bicarbonate  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
>56 ppm/96 hr/fathead minnow/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 106%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Flake; molten; commercial: 99.8%  
7.2 **Storage Temperature:** 268–320°F (liquid); Ambient (solid)  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** U190  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 148.12  
9.3 **Boiling Point at 1 atm:** 544.3°F = 284.6°C = 557.8°K  
9.4 **Freezing Point:** 268°F = 131°C = 404°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.20 at 135°C (liquid) 1.53 at 20°C (solid)  
9.8 **Liquid Surface Tension:** 35.5 dynes/cm = 0.0355 N/m at 155°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 155°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.080  
9.12 **Latent Heat of Vaporization:** 189 Btu/lb = 105 cal/g = 4.40 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** –9473 Btu/lb = –5263 cal/g = –220.4 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** –127 Btu/lb = –70.8 cal/g = –2.96 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

## NOTES

# PHTHALIC ANHYDRIDE

PAN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
280	75.049	270	0.395		N	270	1.188
285	74.870	272	0.396		O	275	1.154
290	74.700	274	0.397		T	280	1.121
295	74.530	276	0.397			285	1.089
300	74.349	278	0.398		P	290	1.059
305	74.179	280	0.399		E	295	1.030
310	74.009	282	0.399		R	300	1.002
315	73.830	284	0.400		T	305	0.975
320	73.660	286	0.401		I	310	0.949
325	73.490	288	0.401		N	315	0.924
330	73.309	290	0.402		E	320	0.900
335	73.139	292	0.403		N	325	0.878
340	72.969	294	0.403		T	330	0.855
345	72.790	296	0.404			335	0.834
350	72.620	298	0.405			340	0.814
355	72.440	300	0.405			345	0.794
360	72.270	302	0.406			350	0.775
365	72.099	304	0.407			355	0.757
370	71.919	306	0.407			360	0.739
375	71.750	308	0.408			365	0.722
380	71.580	310	0.409			370	0.706
385	71.400	312	0.409			375	0.690
390	71.230	314	0.410			380	0.674
		316	0.411			385	0.659
		318	0.411			390	0.645
		320	0.412				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	280	0.207	280	0.00386	0	0.155
	N	300	0.323	300	0.00587	25	0.165
	S	320	0.491	320	0.00869	50	0.175
	O	340	0.728	340	0.01255	75	0.185
	L	360	1.053	360	0.01772	100	0.194
	U	380	1.491	380	0.02449	125	0.203
	B	400	2.070	400	0.03322	150	0.212
	I	420	2.823	420	0.04428	175	0.221
	E	440	3.786	440	0.05807	200	0.230
		460	5.002	460	0.07505	225	0.238
		480	6.516	480	0.09569	250	0.247
		500	8.378	500	0.12050	275	0.255
		520	10.640	520	0.14990	300	0.262
		540	13.370	540	0.18450	325	0.270
		560	16.610	560	0.22480	350	0.278
		580	20.450	580	0.27140	375	0.285
		600	24.940	600	0.32480	400	0.292
		620	30.160	620	0.38550	425	0.299
		640	36.180	640	0.45400	450	0.306
						475	0.312
						500	0.319
						525	0.325
						550	0.331
						575	0.337
						600	0.343

# POTASSIUM ARSENATE

PAS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Macquer's salt Potassium acid arsenate Potassium dihydrogen arsenate	Solid  White  Odorless  Mixes with water.
Stay upwind. Use water spray to "knock down" dust. <b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear goggles and dust respirator. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR SWALLOWED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{KH}_2\text{AsO}_4$
- 2.3 IMO/UN Designation: 6.1/1677
- 2.4 DOT ID No.: 1677
- 2.5 CAS Registry No.: 7784-41-0
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 52389

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; rubber gloves
- 3.2 **Symptoms Following Exposure:** Dust may irritate eyes. Ingestion or severe exposure by inhalation can cause burning of throat and mouth, abdominal pain, vomiting, diarrhea with hemorrhage, dehydration, jaundice, and collapse.
- 3.3 **Treatment of Exposure:** EYES: flush with water to remove dust. INGESTION: immediately induce evacuation of intestinal tract by inducing vomiting, giving gastric lavage and saline cathartic; see physician at once; consider possible development of arsenic poisoning.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** May be carcinogenic; arsenic poisoning may develop.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Not pertinent
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
250 ppm as As/16 hr/minnows/survived
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1 pound
- 8.7 **EPA Pollution Category:** X
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 180.0
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 550°F = 288°C = 561°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.8 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 49 Btu/lb = 27 cal/g = 1.1 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# POTASSIUM ARSENATE

PAS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	20.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# N-PROPYL ACETATE

PAT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, n-propyl ether	Liquid Colorless Mild odor  Floats on water. Flammable, irritating vapor is produced.
<b>Fire</b>  FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, carbon dioxide, or alcohol foam. Water may be ineffective on fire. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, dizziness, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Skim  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula:  $\text{CH}_3\text{COOCH}_2\text{CH}_2\text{CH}_3$   
2.3 IMO/UN Designation: 3.2/1276  
2.4 DOT ID No.: 1276  
2.5 CAS Registry No.: 109-60-4  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask or chemical canister; goggles or face shield; protective gloves.
- 3.2 **Symptoms Following Exposure:** Contact with skin and eyes causes no serious injury. High vapor concentrations will be irritating and will cause nausea, vomiting, and dizziness, with final loss of consciousness.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give artificial respiration if breathing has stopped; give oxygen if breathing is difficult. SKIN AND EYES: flush with water.
- 3.4 TLV-TWA: 200 ppm
- 3.5 TLV-STEL: 250 ppm
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 70 mg/m<sup>3</sup>
- 3.13 **IDLH Value:** 1,700 ppm
- 3.14 **OSHA PEL-TWA:** 200 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 65°F O.C. 58°F C.C.
- 4.2 **Flammable Limits in Air:** 2.0%-8.0%
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; alcohol foam for large fires.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 842°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 820 ppm/24 hr/brine shrimp/TL<sub>m</sub>
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 62% of theoretical in 5 days/freshwater
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 90-100%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester) or pressure-vacuum
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 102.13
- 9.3 **Boiling Point at 1 atm:** 214.9°F = 101.6°C = 374.8°K
- 9.4 **Freezing Point:** -139°F = -95.0°C = 178.2°K
- 9.5 **Critical Temperature:** 528.8°F = 276°C = 549.2°K
- 9.6 **Critical Pressure:** 485 psia = 33 atm = 3.3 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.886 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 24.3 dynes/cm = 0.0243 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.071
- 9.12 **Latent Heat of Vaporization:** 145 Btu/lb = 80.3 cal/g = 3.36 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 1.3 psia

### NOTES

# N-PROPYL ACETATE

PAT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	56.570	35	0.442	85	0.971	55	0.637
40	56.370	40	0.444	90	0.966	60	0.614
45	56.180	45	0.447	95	0.961	65	0.592
50	55.990	50	0.450	100	0.956	70	0.571
55	55.800	55	0.453	105	0.951	75	0.551
60	55.610	60	0.455	110	0.946	80	0.532
65	55.420	65	0.458	115	0.940	85	0.514
70	55.230	70	0.461	120	0.935	90	0.497
75	55.040	75	0.464	125	0.930	95	0.481
80	54.850	80	0.467	130	0.925	100	0.466
85	54.660	85	0.469	135	0.920	105	0.451
90	54.470	90	0.472	140	0.915	110	0.437
95	54.280	95	0.475	145	0.910	115	0.424
100	54.090	100	0.478	150	0.905	120	0.412
105	53.890			155	0.900	125	0.400
110	53.700			160	0.895	130	0.388
115	53.510			165	0.890	135	0.377
120	53.320			170	0.885	140	0.367
125	53.130						
130	52.940						
135	52.750						
140	52.560						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.000	40	0.187	40	0.00356	0	0.265
		50	0.266	50	0.00497	25	0.276
		60	0.373	60	0.00683	50	0.286
		70	0.514	70	0.00923	75	0.297
		80	0.697	80	0.01229	100	0.307
		90	0.933	90	0.01614	125	0.317
		100	1.232	100	0.02094	150	0.327
		110	1.607	110	0.02684	175	0.337
		120	2.072	120	0.03401	200	0.346
		130	2.644	130	0.04266	225	0.356
		140	3.340	140	0.05299	250	0.365
		150	4.179	150	0.06522	275	0.375
		160	5.183	160	0.07957	300	0.384
		170	6.374	170	0.09631	325	0.393
		180	7.777	180	0.11570	350	0.402
		190	9.419	190	0.13790	375	0.410
		200	11.330	200	0.16340	400	0.419
		210	13.530	210	0.19230	425	0.427
		220	16.060	220	0.22490	450	0.436
		230	18.960	230	0.26150	475	0.444
		240	22.240	240	0.30250	500	0.452
		250	25.960	250	0.34800	525	0.460
		260	30.140	260	0.39850	550	0.467
		270	34.830	270	0.45420	575	0.475
		280	40.060	280	0.51530	600	0.482

# POTASSIUM BINOXALATE

PBO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Potassium acid oxalate Sal acetosella Salt of sorrel	Solid  White  Odorless   Sinks in water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing, difficult breathing, or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life if unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{KHC}_2\text{O}_4$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; protective gloves
- 3.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion causes burning pain in throat, esophagus, and stomach; exposed areas of mucous membrane turn white; vomiting, severe purging, weak pulse, and cardiovascular collapse; if death is delayed, neuromuscular symptoms develop. Contact with dust irritates eyes and may cause mild irritation of skin.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air; if exposure to dust is severe, get medical attention. INGESTION: give immediately by mouth a dilute solution of any soluble calcium salt (calcium lactate, lime water, chalk solution, or even milk); large amounts of Ca are required; administer gastric lavage with dilute lime water; consult physician; watch for edema of the glottis and delayed constriction of esophagus. EYES: flush with water for at least 15 min. SKIN: wash well with soap and water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 3;  $\text{LD}_{50}$  = 50-500 mg/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Below 50°C dissolves in water and reacts to form the much less soluble potassium tetraoxalate, which separates out.
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 128.11
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.0 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# POTASSIUM BINOXALATE

PBO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	3.391		N		N		N
36	4.545		O		O		O
38	5.699		T		T		T
40	6.853						
42	8.007		P		P		P
44	9.161		E		E		E
46	10.320		R		R		R
48	11.470		T		T		T
50	12.620		I		I		I
52	13.780		N		N		N
54	14.930		E		E		E
56	16.090		N		N		N
58	17.240		E		E		E
60	18.390		N		N		N
62	19.550		T		T		T
64	20.700						
66	21.860						
68	23.010						
70	24.160						
72	25.320						
74	26.470						
76	27.630						
78	28.780						
80	29.930						
82	31.090						
84	32.240						

# PROPYLENE BUTYLENE POLYMER

PBP

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid

Keep people away.  
Avoid contact with liquid and vapor.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Fire data not available.

### Exposure

CALL FOR MEDICAL AID.  
Exposure data not available.  
Flush affected areas with plenty of water.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
Fouling to shoreline.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 30; Olefin
- 2.2 Formula: Not applicable
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51119

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Currently not available
- 3.2 Symptoms Following Exposure: Currently not available
- 3.3 Treatment of Exposure: Currently not available
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Currently not available
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Currently not available
- 4.4 Fire Extinguishing Agents Not to Be Used: Currently not available
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: Not pertinent
- 9.3 Boiling Point at 1 atm: Very high
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: Currently not available
- 9.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: (est.) -17,000 Btu/lb = -9600 cal/g = -400 X 10<sup>5</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# PROPYLENE BUTYLENE POLYMER

PBP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
C U R R E N T L Y  N O T  A V A I L A B L E		50	0.478	50	1.040		C U R R E N T L Y  N O T  A V A I L A B L E
		52	0.478	52	1.040		
		54	0.478	54	1.040		
		56	0.478	56	1.040		
		58	0.478	58	1.040		
		60	0.478	60	1.040		
		62	0.478	62	1.040		
		64	0.478	64	1.040		
		66	0.478	66	1.040		
		68	0.478	68	1.040		
		70	0.478	70	1.040		
		72	0.478	72	1.040		
		74	0.478	74	1.040		
		76	0.478	76	1.040		
		78	0.478	78	1.040		
		80	0.478	80	1.040		
		82	0.478	82	1.040		
		84	0.478	84	1.040		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B L E			N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

PHOSPHORUS TRIBROMIDE

PBR

CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Phosphorus bromide	Liquid  Colorless to pale yellow  Sharp, penetrating odor   Sinks and mixes violently with water.
Evacuate. Keep people away. Avoid contact with liquid. Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Irritating gases may be produced when heated.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Chemical and Physical Treatment: Neutralize Do not add water to undissolved material	<b>2. CHEMICAL DESIGNATIONS</b>  2.1 CG Compatibility Group: Not listed. 2.2 Formula: PBr <sub>3</sub> 2.3 IMO/UN Designation: 8/1808 2.4 DOT ID No.: 1808 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: 137 2.7 Standard Industrial Trade Classification: 52329
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Acid-gas canister-type mask (full face type for emergencies); chemical safety goggles; apron, gloves, clothing, and safety shoes all made from rubber 3.2 <b>Symptoms Following Exposure:</b> Inhalation causes severe irritation of nose, throat, and lungs. Ingestion causes burns of mouth and stomach. Contact with eyes or skin causes severe burns. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove victim to clear air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: dilute by drinking water, then neutralize with milk of magnesia, egg white, etc.; do not use sodium bicarbonate. EYES: immediately flush with large amounts of water for at least 15 min. SKIN: immediately flush with large amounts of water; remove contaminated clothing. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Currently not available 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Do not use water on adjacent fires.  
4.5 Special Hazards of Combustion Products: Irritating hydrogen bromide and phosphoric acid vapors may form in fire.  
4.6 Behavior in Fire: Acids formed by reaction with water will attack metals and generate flammable hydrogen gas, which may form explosive mixtures in enclosed spaces.  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts violently with water, evolving hydrogen bromide, an irritating and corrosive gas apparent as white fumes  
5.2 Reactivity with Common Materials: In the presence of moisture, highly corrosive to most metals except lead and nickel  
5.3 Stability During Transport: Unstable if heated  
5.4 Neutralizing Agents for Acids and Caustics: Flush with water and rinse with dilute aqueous sodium bicarbonate or soda ash.  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Purified, 88.55%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 270.73  
9.3 Boiling Point at 1 atm: 343°F = 173°C = 446°K  
9.4 Freezing Point: -42.9°F = -40.5°C = 232.7°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 2.862 at 30°C (liquid)  
9.8 Liquid Surface Tension: 45.8 dynes/cm = 0.0458 N/m at 24°C  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: 64.4 Btu/lb = 35.8 cal/g = 1.50 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: -446 Btu/lb = -248 cal/g = -10.4 X 10<sup>5</sup> J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

NOTES

# PHOSPHORUS TRIBROMIDE

PBR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	180.599	85	0.100		N O T  P E R T I N E N T	45	2.243
54	180.599					50	2.167
56	180.500					55	2.094
58	180.400					60	2.025
60	180.400					65	1.960
62	180.299					70	1.898
64	180.199					75	1.839
66	180.199					80	1.783
68	180.099					85	1.729
70	180.000					90	1.678
72	179.900					95	1.630
74	179.900					100	1.583
76	179.799						
78	179.699						
80	179.699						
82	179.599						
84	179.500						
86	179.500						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
R E A C T I V E		110	0.161	110	0.00712	46	0.067
		120	0.210	120	0.00916	48	0.067
		130	0.273	130	0.01167	50	0.067
		140	0.351	140	0.01474	52	0.067
		150	0.447	150	0.01848	54	0.067
		160	0.565	160	0.02300	56	0.067
		170	0.709	170	0.02841	58	0.067
		180	0.884	180	0.03485	60	0.067
		190	1.094	190	0.04248	62	0.067
		200	1.346	200	0.05145	64	0.067
		210	1.645	210	0.06195	66	0.067
		220	1.999	220	0.07417	68	0.067
		230	2.415	230	0.08832	70	0.067
		240	2.902	240	0.10460	72	0.067
		250	3.470	250	0.12330	74	0.067
		260	4.128	260	0.14470	76	0.067
		270	4.887	270	0.16890	78	0.067
		280	5.760	280	0.19640	80	0.067
		290	6.759	290	0.22740		
		300	7.897	300	0.26220		
		310	9.190	310	0.30120		
		320	10.650	320	0.34460		
		330	12.300	330	0.39300		



# N-PROPYLBENZENE

PBZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzene, propyl Isocumene 1-Phenylpropane UN 2364 (DOT)	Liquid                      Light yellow
<p>Keep people away. Avoid contact with liquid and vapor.  <b>EVACUATE AREA.</b>  Wear full face self-contained breathing apparatus and protective clothing.  Shut off ignition sources. Call fire department.  Stay upwind and use water spray to "knock down" vapor.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	Combustible. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective on fire. Wear full face self-contained breathing apparatus, and full protective clothing including rubber boots and gloves. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR  May be irritating to eyes, nose and throat.  If inhaled, will cause dizziness or difficult breathing.  Move to fresh air.  If breathing has stopped, give artificial respiration.  If breathing is difficult, give oxygen.</p> <p>LIQUID  May be irritating to skin and eyes.  May be harmful if swallowed.  Remove contaminated clothing and shoes.  Flush affected areas with plenty of water.  IF IN EYES, hold eyelids open and flush with plenty of water.</p>
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 32; Aromatic hydrocarbons  
2.2 Formula: C<sub>9</sub>H<sub>10</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>  
2.3 IMO/UN Designation: 3.3/2364  
2.4 DOT ID No.: 2364  
2.5 CAS Registry No.: 103-65-1  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion, or skin absorption. May cause eye and skin irritation.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. SKIN: Wash with soap and copious amounts of water. EYES: Flush with copious amounts of water for at least 15 minutes.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 6.04 g/kg rat
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 118°F C.C.
- 4.2 **Flammable Limits in Air:** LEL 0.8%; UEL 6%
- 4.3 **Fire Extinguishing Agents:** Water spray, carbon dioxide, dry chemical, alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Vapor may travel considerable distance to a source of ignition and flashback.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Will not occur
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** A
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable Liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- |                           |                |
|---------------------------|----------------|
| Category                  | Classification |
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 120.20
- 9.3 **Boiling Point at 1 atm:** 318.2°F = 159°C = 432.2°K
- 9.4 **Freezing Point:** -146.2°F = -99°C = 174.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.862
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 4.14
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.1455 psia

### NOTES

# N-PROPYLBENZENE

PBZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.006	43 68 88 100 110 134 161 178 201 236 276 319	0.019 0.039 0.097 0.141 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.260 0.275 0.289 0.303 0.317 0.331 0.344 0.357 0.370 0.383 0.395 0.407 0.419 0.431 0.443 0.454 0.465 0.476 0.487 0.497 0.507 0.517 0.527 0.537 0.546

# POLYCHLORINATED BIPHENYL

PCB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arochlor Chlorinated biphenyl Halogenated waxes PCB Polychloropolyphenyls	Oily liquid to solid powder  Sinks in water.	Light yellow liquid, or white powder	Weak odor
Notify local health and pollution control agencies. Protect water intakes. Keep people away. Avoid contact with liquid and solid. Call fire department.			
<b>Fire</b>	Combustible. Extinguish with water, foam, dry chemical, or carbon dioxide.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: (C<sub>12</sub>H<sub>10-n</sub>)Cl<sub>n</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2315
- 2.5 CAS Registry No.: 1336-36-3
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Gloves and protective garments.
- 3.2 Symptoms Following Exposure: Acne from skin contact.
- 3.3 Treatment of Exposure: SKIN: wash with soap and water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; oral rat LD<sub>50</sub> = 3980 mg/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Causes chromosomal abnormalities in rats, birth defects in birds
- 3.10 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 Liquid or Solid Characteristics: Contact with skin may cause irritation.
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: >286°F
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Irritating gases are generated in fires.
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Cautics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 0.278 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water  
0.005 ppm/336-1080 hr/pinfish/TL<sub>50</sub>/salt water
- 6.2 Waterfowl Toxicity: LD<sub>50</sub> 2000 ppm (mallard duck)
- 6.3 Biological Oxygen Demand (BOD): Very low
- 6.4 Food Chain Concentration Potential: High
- 6.5 GESAMP Hazard Profile:  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 11 grades (some liquid, some solids) which differ primarily in their chlorine content (20%-68% by weight)
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Class 9
- 8.2 49 CFR Class: 9
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: Yes
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 1 pound
- 8.7 EPA Pollution Category: X
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: Not pertinent
- 9.3 Boiling Point at 1 atm: Very high
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.3–1.8 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# POLYCHLORINATED BIPHENYL

PCB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	81.150		N O T		N O T		N O T
69	81.150						
70	81.150						
71	81.150						
72	81.150		P		P		P
73	81.150		E		E		E
74	81.150		R		R		R
75	81.150		T		T		T
76	81.150		I		I		I
77	81.150		N		N		N
78	81.150		E		E		E
79	81.150		N		N		N
80	81.150		E		E		E
81	81.150		T		T		T
82	81.150						
83	81.150						
84	81.150						
85	81.150						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T		N O T		N O T
			P		P		P
			E		E		E
			R		R		R
			T		T		T
			I		I		I
			N		N		N
			E		E		E
			N		N		N
			E		E		E
			T		T		T

# PENTACHLOROETHANE

PCE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethane pentachloride Ethane, pentachloro- Pentalin	Liquid	Colorless	Sweet chloroform-like odor
Sinks in water.			
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear positive pressure breathing apparatus and special protective clothing. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED IN FIRE OR WHEN HEATED TO DECOMPOSITION.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS; MAY BE FATAL IF INHALED OR ABSORBED THROUGH SKIN. Irritating to eyes, skin, lungs and mucous membrane. Narcotic effect greater than chloroform. More potent central nervous system depressant than chloroform or tetrachloroethane. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open if necessary.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open if necessary. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Effects may be delayed; keep victim under observation. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 36; Halogenated hydrocarbons 2.2 Formula: CCl <sub>5</sub> CHCl <sub>3</sub> 2.3 IMO/UN Designation: 6.1/1669 2.4 DOT ID No.: 1669 2.5 CAS Registry No.: 76-01-7 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 51134
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Wear positive pressure breathing apparatus and special protective overclothing. 3.2 <b>Symptoms Following Exposure:</b> Irritation of skin, lungs, eyes, and mucous membrane; depression of central nervous system; and toxicity similar to tetrachloroethanes. 3.3 <b>Treatment of Exposure:</b> INHALATION: Remove to clean air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: If victim is unconscious or having convulsions, do nothing except keep victim warm. EYES: Flush with plenty of water for at least 15 minutes; hold eyelids open if necessary. SKIN: Wash with soap and water. Remove and isolate contaminated clothing and shoes at the site. Speed in removing material from the skin is of extreme importance. Effects may be delayed; keep victim under observation. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; LD <sub>50</sub> = 500 g/kg (dog) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Exposure to 121 ppm 8 to 9 hours daily for 23 days caused significant pathological changes in the liver, lungs, and kidneys of cats. Exposure to vapor for 3 weeks caused fatty degeneration of the liver and injury to the kidneys and lungs of cats. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Causes mucous membrane, skin, lung, and cornea (eye) irritation. 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** None  
4.2 **Flammable Limits in Air:** Nonflammable.  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Contain irritating and toxic chloride vapors.  
4.6 **Behavior in Fire:** Decomposes and produces toxic gases.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Not pertinent  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Not pertinent  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 63/mg/L/48 hr/daphnia magna/ LC<sub>50</sub>/fresh water.  
6.2 **Waterfowl Toxicity:** T<sub>LM</sub> 96: under 1 ppm (species not identified)  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 2  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: 0  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; 96%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** U184  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 202.30  
9.3 **Boiling Point at 1 atm:** 321°F = 160.5°C = 434°K  
9.4 **Freezing Point:** -7.6°F = -22°C = 251.2°K  
9.5 **Critical Temperature:** 734.0°F = 390°C = 663.2°K  
9.6 **Critical Pressure:** 529 psia = 36 atm = 3.6 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.6728 at 25°C  
9.8 **Liquid Surface Tension:** 34.55 dynes/cm = 0.0346 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 7.0 (est)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 78.5 Btu/lb = 43.6 cal/g = 1.83x10<sup>5</sup> J/kg.  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** 1,828 Btu/lb = 1,015.8 cal/g = 4.25x10<sup>5</sup> J/kg  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# PENTACHLOROETHANE

PCE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	104.400		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	68	2.450

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	50 75 100 125 150 175 200 225 250 275 300	0.031 0.107 0.255 0.501 0.869 1.384 2.072 2.958 4.067 5.424 7.056	300 320 340 360 380 400	0.00381 0.00883 0.01944 0.04092 0.08273 0.16132		C U R R E N T L Y  N O T  A V A I L A B L E

# POTASSIUM CHROMATE

PCH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Neutral potassium chromate Potassium chromate (VI)	Solid                      Bright yellow                      Odorless  Sinks and mixes with water.
<p>Keep people away. Avoid contact with solid and dust.  Shut off ignition sources and call fire department.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. May cause fire on contact with combustibles. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.  DUST  Irritating to eyes, nose and throat.  If inhaled will cause coughing or difficult breathing.  If in eyes, hold eyelids open and flush with plenty of water.  If breathing has stopped, give artificial respiration.  If breathing is difficult, give oxygen.</p> <p>SOLID  POISONOUS IF SWALLOWED.  Irritating to skin and eyes.  If swallowed will cause nausea, vomiting or loss of consciousness.  Remove contaminated clothing and shoes.  Flush affected areas with plenty of water.  IF IN EYES, hold eyelids open and flush with plenty of water.  IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Dredge contaminated sediment

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $K_2CrO_4$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed.
- 2.5 CAS Registry No.: 7789-00-6
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52389

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Bu. of Mines approved filter-type respirator; close-fitting safety goggles; rubber boots and apron; safety hat; face shield
- 3.2 **Symptoms Following Exposure:** Inhalation causes local irritation of mucous membranes; continuing nose irritation can result in perforation of nasal septum. Ingestion may cause violent gastroenteritis, circulatory collapse, vertigo, coma, and toxic nephritis; ingestion of excessive quantities can be fatal. Contact with eyes causes severe irritation and conjunctivitis. Repeated or prolonged exposure to dust, mist, or solutions may cause dermatitis; contact with breaks in the skin may cause "chrome sores" appearing as slow-healing, hard-rimmed ulcers which leave the area vulnerable to infection.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water; induce vomiting; treat peripheral vascular shock vigorously; get medical attention. EYES: flush with water for at least 15 min.; get medical attention. SKIN: flush with water; if irritation persists, get medical attention.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 3;  $LD_{50}$  = 50-500 mg/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Lung cancer may occur.
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable but may intensify fire.
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** May increase intensity of fire if in contact with combustible materials. Cool containers and spilled material with plenty of water.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** In contact with combustible materials may cause fire
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
45.6 ppm/96 hr/fathead minnow/TL<sub>m</sub>/soft water  
17.8 ppm"/silver salmon/toxic/salt water  
\*Time period not specified.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Plants can absorb compound from water and pass it on up the food chain. Bioconcentrative up to 2,000 fold. Not likely to be a problem in a spill situation.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent, 99%; CP; Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 194.20
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.73 at 18°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 35.6 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# POTASSIUM CHROMATE

PCH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	57.390		N		N		N
36	57.780		O		O		O
38	58.170		T		T		T
40	58.550						
42	58.940		P		P		P
44	59.330		E		E		E
46	59.720		R		R		R
48	60.110		T		T		T
50	60.500		I		I		I
52	60.890		N		N		N
54	61.280		E		E		E
56	61.670		N		N		N
58	62.050		E		E		E
60	62.440		N		N		N
62	62.830		T		T		T
64	63.220						
66	63.610						
68	64.000						
70	64.389						
72	64.780						
74	65.169						
76	65.549						
78	65.940						
80	66.330						
82	66.719						
84	67.110						



# PERCHLORIC ACID

PCL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dioxonium perchlorate solution Perchloric acid solution		Liquid	Colorless	Odorless
		Sinks and mixes with water.		
Evacuate. Keep people away. Avoid contact with liquid and vapor. Wear rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. May cause fire on contact with combustibles. Containers may explode in fire. POISONOUS GASES MAY BE PRODUCED IN FIRE. Combat fires from safe distance or protected location. Flood discharge area with water. Cool exposed containers with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** HClO<sub>4</sub>-H<sub>2</sub>O  
2.3 **IMO/UN Designation:** 5.1/1873 (50-72% acid); 8/1802 (<50% acid)  
2.4 **DOT ID No.:** 1873 (50-72% acid), 1802 (<50% acid)  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 143 (> 50%); 140 (< 50%)  
2.7 **Standard Industrial Trade Classification:** 52236

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; face shield or vapor-tight chemical-type safety goggles; rubber apron; rubber boots or shoes  
3.2 **Symptoms Following Exposure:** Inhalation of vapors or mist causes burning sensation of nose and throat, and lung irritation with coughing; prolonged or excessive exposure could cause vomiting and severe coughing. Ingestion causes blistering and burns of mouth and stomach. Contact with eyes or skin causes blistering and burns.  
3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound. INHALATION: move to fresh air; give oxygen if necessary. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min. SKIN: flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable, but may explode in fire  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Water from protected area  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Above 160°C (320°F) will react with combustible material and increase intensity of fire. Containers may explode.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Contact with most combustible materials may cause fires and explosions.  
Corrosive to most metals with formation of flammable hydrogen gas, which may collect in enclosed spaces.  
5.3 **Stability During Transport:** Unstable if heated  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water and rinse with dilute sodium bicarbonate or soda ash solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** ACS, 60-72% solution in water.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer  
8.2 **49 CFR Class:** 5.1  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	3
Special (White).....	OX

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 100.46 (solute only)  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** -170°F = -112°C = 161°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.6-1.7 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PERCHLORIC ACID

PCL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	103.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# PERCHLOROMETHYL MERCAPTAN

PCM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Thiocarbonyl tetrachloride Trichloromethyl sulfur chloride Trichloromethanesulfenyl chloride Trichloromethane sulfuryl chloride Trichloromethyl sulfochloride	Liquid Yellow to orange-red Strong unpleasant odor  Sinks in water. Poisonous vapor is produced.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Evacuate area in case of large discharge. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Collection Systems: Pump  
 Chemical and Physical Treatment:  
 Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
 2.2 **Formula:** Cl<sub>3</sub>CSCl  
 2.3 **IMO/UN Designation:** 6.1/1670  
 2.4 **DOT ID No.:** 1670  
 2.5 **CAS Registry No.:** 75-70-7  
 2.6 **NAERG Guide No.:** 157  
 2.7 **Standard Industrial Trade Classification:** 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic and acid-type canister mask or self-contained breathing apparatus; goggles or face shield; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Inhalation may cause severe irritation of upper respiratory tract; brief exposure to low concentrations may produce central nervous system depression and lung, liver, and heart congestion. Severe exposures may be fatal. Contact of liquid with eyes causes immediate eye irritation and severe conjunctivitis; if not promptly washed away, severe corneal damage may result. Liquid also causes severe local skin irritation; may be absorbed through skin in quantities sufficient to produce systemic poisoning. Ingestion may cause damage to the membranes of the mouth, throat, and gastrointestinal tract. Pain and burning of the mouth and throat, nausea, vomiting, cramps and diarrhea may occur. In severe cases, tissue ulceration and central nervous system depression may result.
- 3.3 **Treatment of Exposure:** Get medical attention at once following all exposures to this compound.  
 INHALATION: remove victim to fresh air; give mouth-to-mouth resuscitation if needed. EYES: flush with water for 15 min; if physician is not available, flush for another 15 min. SKIN: flush with water. INGESTION: give large amounts of water, then induce vomiting until vomitus is clear; give milk, eggs, or olive oil to soothe stomach.
- 3.4 **TLV-TWA:** 0.1 ppm  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 83 mg/kg (rat)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** 10 ppm  
 3.14 **OSHA PEL-TWA:** 0.1 ppm.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
 Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
**Products:** Very irritating vapors formed from hot material. May form toxic phosphene gas, hydrogen chloride, and sulfur dioxide.
- 4.6 **Behavior in Fire:** At elevated temperatures will decompose to carbon tetrachloride, sulfur chloride, and heavy oily polymers.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts only when hot to give carbon dioxide, hydrochloric acid, and sulfur.
- 5.2 **Reactivity with Common Materials:**  
 Reacts with iron or steel, evolving carbon tetrachloride. Corrosive to most metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water, rinse with dilute sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
 Currently not available
- 6.4 **Food Chain Concentration Potential:**  
 None
- 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: -  
 Human Oral hazard: 2  
 Human Contact hazard: II  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 97+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 185.9
- 9.3 **Boiling Point at 1 atm:** 300°F = 148°C = 421°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.706 at 11°C (liquid)
- 9.8 **Liquid Surface Tension:** 35.02 dynes/cm = 0.03502 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
 Not pertinent
- 9.12 **Latent Heat of Vaporization:** (est.) 94 Btu/lb = 52 cal/g = 2.2 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PERCHLOROMETHYL MERCAPTAN

PCM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
28	107.400	60	0.300	51	1.048		N O T  P E R T I N E N T
30	107.200	61	0.300	52	1.048		
32	107.099	62	0.300	53	1.048		
34	107.000	63	0.300	54	1.048		
36	106.900	64	0.300	55	1.048		
38	106.799	65	0.300	56	1.048		
40	106.700	66	0.300	57	1.048		
42	106.599	67	0.300	58	1.048		
44	106.400	68	0.300	59	1.048		
46	106.299	69	0.300	60	1.048		
48	106.200	70	0.300	61	1.048		
50	106.099	71	0.300	62	1.048		
52	106.000	72	0.300	63	1.048		
54	105.900	73	0.300	64	1.048		
56	105.799	74	0.300	65	1.048		
58	105.700	75	0.300	66	1.048		
60	105.599	76	0.300	67	1.048		
62	105.500	77	0.300	68	1.048		
64	105.400	78	0.300	69	1.048		
66	105.299	79	0.300	70	1.048		
68	105.200	80	0.300	71	1.048		
70	105.099	81	0.300	72	1.048		
72	105.000	82	0.300	73	1.048		
74	104.900	83	0.300	74	1.048		
76	104.799	84	0.300	75	1.048		
78	104.700	85	0.300	76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T		N O T		N O T
	R E A C T S  S L O W L		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T

# PROPIONITRILE

PCN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cyanoethane Ether cyanatus Ethylcyanide Hydrocyanic ether Propanenitrile Propionic nitrile	Liquid  Colorless  Ethereal odor  Floats on water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID OR VAPOR. EVACUATE AREA.</b> Shut off all sources of ignition, call fire department. Wear positive pressure breathing apparatus and special protective clothing. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire. Vapor explosion and poison hazard indoors, outdoors or in sewers. Extinguish fires with dry chemical, CO <sub>2</sub> , foam, or water spray. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. Harmful if inhaled. IF INHALED: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to the skin and eyes. Harmful if swallowed or skin is exposed. Remove and isolate contaminated clothing and shoes at the site. Flush affected areas immediately with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk and victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm. Effects may be delayed; keep victim under observation.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE AT LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Fouling to shoreline. Notify local health and wildlife officials. Notify operators of local water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Contain  
Collection Systems: Skim  
Do not burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 37; Nitriles  
2.2 Formula: C<sub>3</sub>H<sub>5</sub>CN  
2.3 IMO/UN Designation: 3.2/2404  
2.4 DOT ID No.: 2404  
2.5 CAS Registry No.: 107-12-0  
2.6 NAERG Guide No.: 131  
2.7 Standard Industrial Trade Classification: 51484

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear appropriate approved respirator, chemical resistant gloves, rubber boots, safety goggles, and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Dizziness, rapid respirations, headache, drowsiness, drop in blood pressure, and pulse, delayed symptoms. May cause cyanosis (blue-grey coloration of skin and lips caused by lack of oxygen).
- 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing difficult, give oxygen. EYES: Hold eyelids open and flush with water for 15 minutes. INGESTION: If victim is conscious, have victim drink water or milk and have victim induce vomiting. If victim is unconscious, do nothing except keep victim warm. Call for medical aid. SKIN: Remove contaminated clothes and shoes. Wash affected areas with plenty of water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> = 36 mg/kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 36°F C.C.  
4.2 **Flammable Limits in Air:** LEL 3.1%  
4.3 **Fire Extinguishing Agents:** Water spray or mist, foam, CO<sub>2</sub>, dry chemical.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic fumes of CN and NO<sub>x</sub>.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 25.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable Liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	3
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** P101  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 55.08  
9.3 **Boiling Point at 1 atm:** 207.1°F = 97.3°C = 370.5°K  
9.4 **Freezing Point:** -135°F = -92.8°C = 180°K  
9.5 **Critical Temperature:** 555.4°F = 290.8°C = 564°K  
9.6 **Critical Pressure:** 607.1 psia = 41.3 atm = 4.2 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.702 at 20°C  
9.8 **Liquid Surface Tension:** 27.2 dyne/cm at 20°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 1.9  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 241.7 Btu/lb = 134.3 cal/g = 5.6 x 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -1,491.5 Btu/lb = -82.86 cal/g = -347 x 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 1.7 psia

### NOTES

# PROPIONITRILE

PCN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	48.810		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	-30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200	0.025 0.033 0.043 0.056 0.073 0.095 0.123 0.160 0.209 0.272 0.354 0.461 0.600 0.781 1.016 1.323 1.722 2.241 2.917 3.797 4.942 6.433 8.373 10.899		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.314 0.321 0.328 0.334 0.342 0.349 0.356 0.363 0.371 0.379 0.387 0.395 0.403 0.412 0.420 0.429 0.438 0.447 0.457 0.466 0.476 0.486 0.496 0.507 0.517

# PENTACHLOROPHENOL

PCP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dowicide 7 Penta Santophen 20		Solid beads or flakes    White to light brown
		Sinks in water.
Keep people away. Avoid contact with solid and dust. Wear goggles and self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable.	
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled, will cause coughing or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_5Cl_5OH$   
2.3 IMO/UN Designation: 6.1/2020  
2.4 DOT ID No.: 3155  
2.5 CAS Registry No.: 87-86-5  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 51244

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respirator for dust; goggles; protective clothing.  
3.2 **Symptoms Following Exposure:** Dust or vapor irritates skin and mucous membranes, causing coughing and sneezing. Ingestion causes loss of appetite, respiratory difficulties, anesthesia, sweating, coma. Overexposure can cause death.  
3.3 **Treatment of Exposure:** Call a doctor] INGESTION: induce vomiting at once. EYES: flush with water for 15-30 min. SKIN: wash well with soap and water.  
3.4 **TLV-TWA:** 0.5 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 2.5 mg/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 0.5 mg/m<sup>3</sup>  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Generates toxic and irritating vapors.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
5 ppm/3 hr/trout/lethal/fresh water  
6.2 **Waterfowl Toxicity:** 4500 ppm/LC<sub>50</sub>/mallards  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 86-100%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: U242/D037  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 266.35  
9.3 **Boiling Point at 1 atm:** 590°F = 310°C = 583°K  
9.4 **Freezing Point:** 370°F = 188°C = 461°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.98 at 15°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PENTACHLOROPHENOL

PCP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.100		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# POTASSIUM CHLORATE

PCR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlorate of potash Chlorate of potassium Potcrate	Solid  White  Odorless  Mixes with water.
Keep people away. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. POISONOUS GASES ARE PRODUCED IN FIRE. Flood discharged area with water.
<b>Exposure</b>	Call for medical aid. DUST Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water.  SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{KClO}_3$   
2.3 IMO/UN Designation: 5.1/1485  
2.4 DOT ID No.: 1485  
2.5 CAS Registry No.: 3811-04-9  
2.6 NAERG Guide No.: 140  
2.7 Standard Industrial Trade Classification: 52339

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; rubber gloves; goggles; protective clothing to prevent contact with skin.  
3.2 **Symptoms Following Exposure:** Inhalation of dust can irritate nose and throat. Contact with eyes or skin causes irritation. Ingestion causes abdominal pain, nausea, vomiting, cyanosis, collapse.  
3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min. SKIN: wash with soap and water. INGESTION: dilute by drinking soapy or salty water to induce vomiting; call physician.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable, but may cause fire upon contact with ordinary combustibles  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water on adjacent fires  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic fumes are formed in fires.  
4.6 **Behavior in Fire:** Decomposes when hot to form oxygen, which increases severity of fire.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Contact with combustible material may cause fire.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 2  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial: 99.7+%; Reagent; Purified  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer  
8.2 **49 CFR Class:** 5.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0 2            |
| Flammability (Red).....   | 0 0            |
| Instability (Yellow)..... | 0 0            |
| Special (White).....      | OX OX          |

- \* First column refers to non-fire situation.  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 122.6  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:**  $680^{\circ}\text{F} = 360^{\circ}\text{C} = 633^{\circ}\text{K}$   
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 2.34 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:**  $-176 \text{ Btu/lb} = -98 \text{ cal/g} = -4.1 \times 10^5 \text{ J/kg}$   
9.15 **Heat of Solution:**  $147 \text{ Btu/lb} = 81.9 \text{ cal/g} = 3.43 \times 10^5 \text{ J/kg}$   
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# POTASSIUM CHLORATE

PCR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	3.522		N		N		N
36	3.744		O		O		O
38	3.966		T		T		T
40	4.188						
42	4.411		P		P		P
44	4.633		E		E		E
46	4.855		R		R		R
48	5.077		T		T		T
50	5.300		I		I		I
52	5.522		N		N		N
54	5.744		E		E		E
56	5.966		N		N		N
58	6.188		E		E		E
60	6.411		N		N		N
62	6.633		T		T		T
64	6.855						
66	7.077						
68	7.300						
70	7.522						
72	7.744						
74	7.966						
76	8.188						
78	8.411						
80	8.633						
82	8.855						
84	9.077						

# PENTADECANOL

PDC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Pentadecanol Pentadecyl alcohol	Liquid                      Colorless                      Faint alcohol odor  Floats on water.
Keep people away. Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Harmful to fish and water fowl. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 20; Alcohol, glycol  
 2.2 **Formula:** CH<sub>3</sub>(CH<sub>2</sub>)<sub>13</sub>CH<sub>2</sub>OH  
 2.3 **IMO/UN Designation:** Not listed  
 2.4 **DOT ID No.:** Not listed  
 2.5 **CAS Registry No.:** 629-76-5  
 2.6 **NAERG Guide No.:** Not listed  
 2.7 **Standard Industrial Trade Classification:** 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield.  
 3.2 **Symptoms Following Exposure:** Low toxicity. Excessive exposure produces some central nervous system depression. Prolonged contact produces skin irritation.  
 3.3 **Treatment of Exposure:** INHALATION: if necessary, support respiration. INGESTION: induce vomiting and call a doctor. SKIN OR EYES: wash with copious amounts of water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Foam, dry chemical or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Currently not available  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 228.42  
 9.3 **Boiling Point at 1 atm:** 572°F = 300°C = 573°K  
 9.4 **Freezing Point:** 111°F = 44°C = 317°K  
 9.5 **Critical Temperature:** 824.0°F = 440°C = 713.2°K  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.829 at 50°C (liquid)  
 9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 50°C  
 9.9 **Liquid Water Interfacial Tension:** (est.) 35 dynes/cm = 0.035 N/m at 50°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.024  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** Currently not available  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Not pertinent  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PENTADECANOL

PDC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
111	51.120	122	0.502	122	1.040	122	1.626
112	51.120	123	0.502	123	1.040	123	1.592
113	51.120	124	0.502	124	1.040	124	1.558
114	51.120	125	0.502	125	1.040	125	1.526
115	51.120	126	0.502	126	1.040	126	1.494
116	51.120	127	0.502	127	1.040	127	1.463
117	51.120	128	0.502	128	1.040	128	1.433
118	51.120	129	0.502	129	1.040	129	1.403
119	51.120	130	0.502	130	1.040	130	1.374
120	51.120	131	0.502	131	1.040	131	1.346
121	51.120	132	0.502	132	1.040	132	1.319
122	51.120	133	0.502	133	1.040	133	1.292
123	51.120	134	0.502	134	1.040	134	1.266
124	51.120	135	0.502	135	1.040	135	1.240
125	51.120	136	0.502	136	1.040	136	1.215
126	51.120	137	0.502	137	1.040	137	1.191
127	51.120	138	0.502	138	1.040	138	1.167
128	51.120	139	0.502	139	1.040	139	1.144
129	51.120						
130	51.120						
131	51.120						
132	51.120						
133	51.120						
134	51.120						
135	51.120						
136	51.120						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	360	0.358	360	0.00929	0	0.334
	N	380	0.578	380	0.01464	25	0.348
	S	400	0.900	400	0.02229	50	0.363
	O	420	1.360	420	0.03289	75	0.377
	L	440	1.996	440	0.04721	100	0.391
	U	460	2.857	460	0.06609	125	0.405
	B	480	3.995	480	0.09047	150	0.419
	L	500	5.472	500	0.12130	175	0.433
	E	520	7.353	520	0.15970	200	0.446
		540	9.712	540	0.20670	225	0.459
		560	12.630	560	0.26350	250	0.472
		580	16.180	580	0.33110	275	0.485
		600	20.450	600	0.41070	300	0.498
		620	25.540	620	0.50340	325	0.511
		640	31.540	640	0.61030	350	0.523
		660	38.530	660	0.73230	375	0.535
						400	0.548
						425	0.560
						450	0.571
						475	0.583
						500	0.594
						525	0.606
						550	0.617
						575	0.628
						600	0.638

# 1,3-PENTADIENE

PDE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> alpha-Methylvinyl 1-Methylbutadiene cis-Pentadiene-1,3 trans-Pentadiene-1,3 Piperylene	Liquid  Colorless  Floats on water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Containers may explode in fire. Water may be ineffective on fire. Combat fires from behind barrier or protected location. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray, or foam; large fires: water spray, fog or foam. Wear self-contained positive pressure breathing apparatus and full protective clothing. Move container from fire area if you can do it without risk. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May cause dizziness or suffocation. May irritate eyes and skin. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID May irritate skin and eyes. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefins  
2.2 Formula: CH<sub>2</sub>=CHCH=CHCH<sub>3</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 504-60-9  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Vapors may cause dizziness or suffocation; contact may irritate skin and eyes.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush immediately with running for at least 15 minutes; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. If swallowed and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** May irritate eyes and mucous membranes.
- 3.11 **Liquid or Solid Characteristics:** Liquid may cause irritation of the eyes and skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
-20°F C.C.
- 4.2 **Flammable Limits in Air:** 2% - 8.3%
- 4.3 **Fire Extinguishing Agents:** Small fires: Dry chemical, carbon dioxide, water spray, fog or foam; large fires: Water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective; material floats on surface.
- 4.5 **Special Hazards of Combustion Products:** Fire produces irritating and poisonous gases.
- 4.6 **Behavior in Fire:** Will burn and produce irritating and poisonous gases. Container may explode in heat of fire. Vapor explosion hazard indoors, outdoors, or in sewers. Runoff to sewer may create fire or explosion hazard.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** 2,6-Ditertiarybutyl-4-methylphenol

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
100-1000 ppm/96 hr/TLm
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 90%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 4              |
| Instability (Yellow)..... | 2              |
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U186
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 68.12
- 9.3 **Boiling Point at 1 atm:** -45°F = -42.8°C = 230.2°K
- 9.4 **Freezing Point:** -222°F = -141°C = 132°K
- 9.5 **Critical Temperature:** 411°F = 211°C = 484°K (est.)
- 9.6 **Critical Pressure:** 542 psia = 37 atm = 3.7 MN/m<sup>2</sup> (est.)
- 9.7 **Specific Gravity:** 0.6834 at 20°C (average value for cis and trans isomers)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 2.4 (est.)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** 193 Btu/lb = 107 cal/g = 4.50 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -20,167 Btu/lb = -11,207 cal/g = -46.9 x 10<sup>6</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1,3-PENTADIENE

PDE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	42.660		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	-75 -50 -25 0 25 50 75	0.075 0.165 0.363 0.798 1.758 3.872 8.256	-75 -50 -25 0 25 50 75	0.00123 0.00257 0.00535 0.01114 0.02321 0.04834 0.10068		C U R R E N T L Y  N O T  A V A I L A B L E

# PARALDEHYDE

PDH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> p-Acetaldehyde Paracetaldehyde 2,4,6-Trimethyl-1,3,5-trioxane	Liquid  Colorless  Characteristic aromatic odor  Floats and mixes with water.
Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid. Wear goggles and self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with alcohol foam, carbon dioxide, or dry chemical. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID If swallowed, will cause headache, incoordination, drowsiness, or coma. Irritating to eyes and skin. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_4H_6O_3$   
2.3 IMO/UN Designation: 3.3/1264  
2.4 DOT ID No.: 1264  
2.5 CAS Registry No.: 123-63-7  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51622

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear rubber gloves, self-contained breathing apparatus.  
3.2 **Symptoms Following Exposure:** INHALATION AND INGESTION: Irritation, headache, bronchitis, pulmonary edema. Irritating to digestive tract. Hypnotic and analgesic properties. Incoordination and drowsiness, followed by sleep. Larger doses-coma-weak pulse and shallow respiration, cyanosis-death from respiratory paralysis. EYES: irritation-can cause serious injury. SKIN: Dermatitis (skin inflammation).  
3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from exposure, give artificial respiration or oxygen if indicated. EYES: Irrigate with water for 15 minutes. SKIN: Wash contaminated area with soap and water. INGESTION: Gastric lavage, saline catharsis.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2:  $LD_{50} = 500$  to  $5000$  mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Chronic intoxication-digestive disturbances, thirst, emaciation, muscular weakness, mental fatigue. Tremors of hands and tongue. Can cause skin eruptions. This is addictive.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 96°F O.C.  
4.2 **Flammable Limits in Air:** 1.3% (lower limit)  
4.3 **Fire Extinguishing Agents:** Alcohol foam,  $CO_2$ , or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water  
4.5 **Special Hazards of Combustion Products:** Emits toxic fumes on heating.  
4.6 **Behavior in Fire:** Can react vigorously when exposed to heat or flame. Vapor is heavier than air and may travel a considerable distance to source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 460°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Currently not available  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation:  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** U182  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 132.16  
9.3 **Boiling Point at 1 atm:** 262.4°F = 128°C = 401.2°K  
9.4 **Freezing Point:** 54.7°F = 12.6°C = 285.8°K  
9.5 **Critical Temperature:** 554.0°F = 290°C = 563.2°K  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.9943 at 20°C  
9.8 **Liquid Surface Tension:** 27.82 dynes/cm = 0.02782 N/m at 5°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.55  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 135 Btu/lb = 75 cal/g =  $3.1 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** At 25°C -10,174 Btu/lb = -5,652 cal/g =  $236 \times 10^6$  J/kg  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PARALDEHYDE

PDH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	62.252	32	0.436	90	1.002	50	1.571
70	61.835			95	0.999	60	1.313
80	61.421			100	0.996	70	1.128
90	61.009			105	0.993	80	0.990
100	60.600			110	0.991	90	0.883
110	60.194			115	0.988	100	0.797
120	59.790			120	0.985	110	0.726
130	59.390			125	0.982	120	0.668
140	58.992			130	0.980	130	0.618
150	58.596			135	0.977	140	0.576
160	58.203			140	0.974	150	0.539
170	57.813			145	0.971	160	0.506
180	57.426			150	0.968	170	0.478
190	57.041			155	0.966	180	0.453
				160	0.963	190	0.430
				165	0.960	200	0.410
				170	0.957	210	0.391
				175	0.955	220	0.375
						230	0.359
						240	0.345

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
15	11.857	70	1.036	70	0.02066	C U R R E N T L Y  N O T  A V A I L A B L E	
20	11.501	80	3.363	80	0.05999		
25	11.145	90	5.172	90	0.09058		
30	10.789	100	6.620	100	0.11505		
35	10.432	110	7.804	110	0.13507		
40	10.076	120	8.791	120	0.15176		
45	9.720	130	9.627	130	0.16588		
50	9.363	140	10.342	140	0.17798		
55	9.007	150	10.963	150	0.18846		
60	8.651	160	11.506	160	0.19764		
65	8.294	170	11.985	170	0.20574		
70	7.938	180	12.410	180	0.21294		
75	7.582	190	12.791	190	0.21938		
80	7.225	200	13.134	200	0.22517		
85	6.869	210	13.444	210	0.23042		
90	6.513	220	13.727	220	0.23518		
95	6.156	230	13.984	230	0.23953		
100	5.800	240	14.220	240	0.24352		
		250	14.437	250	0.24720		
		260	14.638	260	0.25058		



# PHENYLDICHLOROARSINE

PDL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Phenylarsenic dichloride		Liquid	Colorless to yellow	Weak unpleasant odor
		Sinks in water.		
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID.</b> Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Fire data not available. POISONOUS GASES ARE PRODUCED WHEN HEATED.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Chemical and Physical Treatment:  
Neutralize  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** C<sub>6</sub>H<sub>5</sub>AsCl<sub>2</sub>  
2.3 **IMO/UN Designation:** 6.1/1556  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** 696-28-6  
2.6 **NAERG Guide No.:** 152  
2.7 **Standard Industrial Trade Classification:** 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full protective clothing; gas mask or self-contained breathing apparatus
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory system, pulmonary edema, and systemic effects. Vapor irritates eyes. Liquid causes severe burns of eyes and severe irritation or burns of skin. Ingestion causes severe irritation or burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention at once following all exposures to this compound.  
INHALATION: remove victim from exposure; give artificial respiration if breathing has ceased.  
EYES: immediately wash with copious amounts of water for at least 15 min. SKIN: flush with water and wash well with soap and water; compound can be absorbed through skin and cause toxic systemic effects. INGESTION: give large amounts of water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Highly toxic arsenic fumes are formed when hot.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 1.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Very slow reaction, considered non-hazardous. Hydrochloric acid is formed.  
5.2 **Reactivity with Common Materials:** Corrodes metals because of acid formed.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 222.9  
9.3 **Boiling Point at 1 atm:** 495°F = 257°C = 530°K  
9.4 **Freezing Point:** 3.9°F = -15.6°C = 257.6°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.657 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 44.64 dynes/cm = 0.04464 N/m at 18°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 99 Btu/lb = 55 cal/g = 2.3 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -6,450 Btu/lb = -3,600 cal/g = -150 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PHENYLDICHLOROARSINE

PDL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	104.200	52	0.400	52	1.048		N O T  P E R T I N E N T
36	104.099	54	0.400	54	1.048		
38	104.000	56	0.400	56	1.048		
40	104.000	58	0.400	58	1.048		
42	103.900	60	0.400	60	1.048		
44	103.799	62	0.400	62	1.048		
46	103.799	64	0.400	64	1.048		
48	103.700	66	0.400	66	1.048		
50	103.599	68	0.400	68	1.048		
52	103.599	70	0.400	70	1.048		
54	103.500	72	0.400	72	1.048		
56	103.400	74	0.400	74	1.048		
58	103.299	76	0.400	76	1.048		
60	103.299	78	0.400	78	1.048		
62	103.200	80	0.400	80	1.048		
64	103.099	82	0.400	82	1.048		
66	103.099	84	0.400	84	1.048		
68	103.000	86	0.400	86	1.048		
70	102.900						
72	102.900						
74	102.799						
76	102.700						
78	102.599						
80	102.599						
82	102.500						
84	102.400						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	60	0.001	60	0.00003		N O T  P E R T I N E N T
		70	0.001	70	0.00005		
		80	0.002	80	0.00007		
		90	0.003	90	0.00010		
		100	0.004	100	0.00015		
		110	0.006	110	0.00020		
		120	0.008	120	0.00028		
		130	0.011	130	0.00038		
		140	0.015	140	0.00051		
		150	0.020	150	0.00068		
		160	0.027	160	0.00090		
		170	0.036	170	0.00117		
		180	0.047	180	0.00152		
		190	0.061	190	0.00195		
		200	0.079	200	0.00249		
		210	0.102	210	0.00315		

# 1,4-PENTADIENE

PDN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Allylethylene divinylmethane Penta-1,4-diene		Liquid  Colorless  Floats on water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Containers may explode in fire. Wear self-contained positive pressure breathing apparatus and full protective clothing. Combat fires from behind barrier or protected location. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Water may be ineffective on fire. Move container from fire area if you can do it without risk. Cool exposed containers with water.	
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> May cause dizziness or suffocation. May irritate eyes and skin. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> May irritate skin and eyes. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Chemical and Physical Treatment: Burn	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> Not listed. <b>2.2 Formula:</b> H <sub>2</sub> C=CHCH=CH <sub>2</sub> <b>2.3 IMO/UN Designation:</b> Not listed <b>2.4 DOT ID No.:</b> Not listed <b>2.5 CAS Registry No.:</b> 591-93-5 <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 51119
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. <b>3.2 Symptoms Following Exposure:</b> Vapor may cause dizziness or suffocation. Contact may irritate skin and eyes. <b>3.3 Treatment of Exposure:</b> INHALATION: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush immediately with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Currently not available <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Currently not available <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapor may irritate eyes and respiratory tract. <b>3.11 Liquid or Solid Characteristics:</b> Liquid may irritate eyes and skin. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEG1:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 40°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray, fog or foam; large fires: water spray, fog or foam.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective since this material floats.  
**4.5 Special Hazards of Combustion Products:** Fire may produce irritating and poisonous gases.  
**4.6 Behavior in Fire:** Flammable vapor may spread away from spill. Container may explode in heat of fire. Vapor explosion hazard indoors, outdoors or sewers. Runoff to sewer may create fire or explosion hazard. Fire may generate toxic and irritating gases.  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Currently not available  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Currently not available  
**5.6 Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 99%  
**7.2 Storage Temperature:** Currently not available  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed  
**8.2 49 CFR Class:** Not pertinent  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 68.13  
**9.3 Boiling Point at 1 atm:** 78.8°F = 26.0°C = 299.2°K  
**9.4 Freezing Point:** -234.9°F = -148.3°C = 124.9°K  
**9.5 Critical Temperature:** 369°F = 187°C = 460°K (est.)  
**9.6 Critical Pressure:** 540 psia = 37 atm = 3.7 MN/m<sup>2</sup> (est.)  
**9.7 Specific Gravity:** 0.6608 at 20°C  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** 2.3  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** 180 Btu/lb = 100 cal/g = 4.20 x 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -20,316 Btu/lb = -11,288 cal/g = -47.3 x 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# 1,4-PENTADIENE

PDN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
78	41.250	77	0.511		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	-100 -75 -50 -25 0 25 50	0.066 0.151 0.345 0.788 1.798 4.101 9.357	-100 -75 -50 -25 0 25 50	0.00117 0.00251 0.00541 0.01163 0.02502 0.05383 0.11580		C U R R E N T L Y  N O T  A V A I L A B L E

# POTASSIUM DICHLORO-S-TRIAZINETRIONE

PDT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Potassium dichloroisocyanurate		Solid	White	Chlorine-like odor
		Mixes with water.		
<b>Keep people away.</b> <b>Avoid contact with solid and dust.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>				
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Flood discharge area with water.			
<b>Exposure</b>	Call for medical aid. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $KCl_2(NCO)_3$
- 2.3 IMO/UN Designation: 5.1/-
- 2.4 DOT ID No.: 2465
- 2.5 CAS Registry No.: 2244-21-5
- 2.6 NAERG Guide No.: 141
- 2.7 Standard Industrial Trade Classification: 51489

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask or chlorine canister mask; goggles; rubber gloves and other protective clothing to prevent contact with skin.
- 3.2 **Symptoms Following Exposure:** Dust causes sneezing and coughing; is moderately irritating to the eyes and causes itching and redness of skin. Ingestion causes burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. EYES: irrigate with running water for 15 min.; call a physician. SKIN: flush with water. INGESTION: induce vomiting and call physician.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5$  to 5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable but may cause fire upon contact with ordinary combustibles
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** May form toxic chlorine and other gases in fire
- 4.6 **Behavior in Fire:** Decomposition can be initiated with a heat source and can propagate throughout the mass with the evolution of dense fumes. Containers may explode when heated.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Forms a bleach solution; the reaction is not violent.
- 5.2 **Reactivity with Common Materials:**  
Contact with most foreign materials, organic matter, or easily chlorinated or oxidized materials may result in fire. Avoid oil, grease, sawdust, floor sweepings, other easily oxidized organic compounds.
- 5.3 **Stability During Transport:** Stable if dry
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; 39-59% available chlorine.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	2
Special (White).....	OX
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 236.1
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.96 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# POTASSIUM DICHLORO-S-TRIAZINETRIONE

PDT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	9.900		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# POLYETHYLENE POLYAMINES

PEB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Poly(ethyleneimine) Polyethyleneimine	Liquid  Yellowish  Amine odor  Miscible in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE POISONOUS GASES ARE PRODUCED IN FIRE. Poisonous gas may be produced in fire or when heated. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or alcohol foam; large fires: water spray, fog or alcohol foam. Move container from fire area if you can do it without risk. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be harmful if inhaled. May irritate eyes and skin. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Move to fresh air.  LIQUID Irritating to eyes and skin. May be harmful if swallowed. IF IN EYES OR ON SKIN: flush with plenty of running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. IF SWALLOWED and victim is CONSCIOUS, have victim drink water and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effects of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amines  
2.2 Formula: (C<sub>2</sub>H<sub>5</sub>N)<sub>x</sub>  
2.3 IMO/UN Designation: 8/2735  
2.4 DOT ID No.: 2735  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51452

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained positive pressure breathing apparatus and full protective clothing.  
3.2 **Symptoms Following Exposure:** May be harmful if inhaled. Irritating to eyes and skin. May be harmful if swallowed.  
3.3 **Treatment of Exposure:** INHALATION: Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. INGESTION: If swallowed and victim is conscious have victim drink water and induce vomiting. If swallowed and victim is unconscious or having convulsions, do nothing except keep victim warm.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** A strong eye and skin irritant.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 206.6°F  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Small fires: dry chemicals, CO<sub>2</sub>, water spray or alcohol foam. Large fires: water spray, fog or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Contain toxic and irritating gases.  
4.6 **Behavior in Fire:** Gives off toxic gases (NO<sub>x</sub>).  
4.7 **Auto Ignition Temperature:** 743°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Incompatible with aluminum, zinc and other nonferrous metals.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** (C)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** Currently not available.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Currently not available  
9.3 **Boiling Point at 1 atm:** 401°F = 205°C = 478°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.99 (temperature unknown)(liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# POLYETHYLENE POLYAMINES

PEB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T



# PENTAETHYLENEHEXAMINE

PEN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Levepox hardener T3 3,6,9,12-Tetraazatetradecane- 1,14-diamine	Liquid	Yellowish	Ammonia-like odor
Wear chemical protective gloves, goggles and approved respirator. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Containers could rupture when overheated. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with alcohol foam, sand, dry chemical, or CO <sub>2</sub> . Use water spray to cool exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, administer large quantities of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $H_2N(CH_2CH_2NH)_4CH_2CH_2NH_2$   
2.3 IMO/UN Designation: Currently not  
available  
2.4 DOT ID No.: 2735  
2.5 CAS Registry No.: 4067-16-7  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification:  
51452

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear chemical protective gloves. Wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Contact with eyes can cause slight to moderate irritation and possible burns. May cause transient fogging of the eyes as a result of corneal edema, which is reversible. May cause moderate skin irritation or allergic skin reaction with symptoms of redness, itching, swelling, or rash. Vapors may irritate the eyes, nose, throat, and respiratory tract. May cause coughing, headache, nausea and vomiting. If swallowed, may cause nausea, vomiting and abdominal pain. May cause burns of the mouth, throat, esophagus, and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. INGESTION: Have the victim drink large quantity of water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; oral rat LD<sub>50</sub> = 4.13 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:  
347-405°F C.C.
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Alcohol foam, sand, dry chemical, or CO<sub>2</sub>.
- 4.4 Fire Extinguishing Agents Not to Be Used: Do not use water.
- 4.5 Special Hazards of Combustion  
Products: Irritating vapors and toxic gases, such as amine vapors, nitrogen oxides, and carbon monoxide, may be formed when involved in fire.
- 4.6 Behavior in Fire: Containers may rupture when overheated.
- 4.7 Auto Ignition Temperature: 680°F.
- 4.8 Electrical Hazards: Not listed.
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 95.2 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 30.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.
- 5.2 Reactivity with Common Materials: Incompatible with oxidizing materials, isocyanates, and acids.
- 5.3 Stability During Transport: Stable.
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
- 5.5 Polymerization: Will not polymerize.
- 5.6 Inhibitor of Polymerization: Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: (1)  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical grades.
- 7.2 Storage Temperature: Ambient.
- 7.3 Inert Atmosphere: No requirement.
- 7.4 Venting: Not listed.
- 7.5 IMO Pollution Category: D
- 7.6 Ship Type: Data not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material
- 8.2 49 CFR Class: 8
- 8.3 49 CFR Package Group: Currently not available.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 232.38
- 9.3 Boiling Point at 1 atm: 662 - 734°F = 350 - 390°C = 623 - 663°K
- 9.4 Freezing Point: Currently not available
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 1.0 @ 20°C.
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Currently not available
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent.
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# PENTAETHYLENEHEXAMINE

PEN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	8.350		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# PENTAERYTHRITOL

PET

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,2-bis(Hydroxymethyl)-1,3-propanediol Mono PE PE Pentaerythrite Pentek Tetrahydroxymethylmethane	Solid                      White                      Odorless
	Sinks and mixes slowly with water.
Keep people away. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	VAPOR OR DUST Not harmful. If in eyes, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
 Stop discharge  
 Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula: C(CH<sub>2</sub>OH)<sub>4</sub>  
 2.3 IMO/UN Designation: Not listed  
 2.4 DOT ID No.: Not listed  
 2.5 CAS Registry No.: Currently not available  
 2.6 NAERG Guide No.: Not listed  
 2.7 Standard Industrial Trade Classification: 51229

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Dust mask; goggles  
 3.2 Symptoms Following Exposure: Non-toxic; no symptoms likely  
 3.3 Treatment of Exposure: None needed  
 3.4 TLV-TWA: 10 mg/m<sup>3</sup>  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 Toxicity by Ingestion: Grade 0; LD<sub>50</sub> > 15 g/kg  
 3.8 Toxicity by Inhalation: Currently not available.  
 3.9 Chronic Toxicity: None  
 3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
 3.11 Liquid or Solid Characteristics: Currently not available  
 3.12 Odor Threshold: Odorless  
 3.13 IDLH Value: Not listed.  
 3.14 OSHA PEL-TWA: 15 mg/m<sup>3</sup>, total dust; 5 mg/m<sup>3</sup> respirable fraction.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: Not pertinent  
 4.2 Flammable Limits in Air: Not pertinent  
 4.3 Fire Extinguishing Agents: Water, dry chemical, carbon dioxide  
 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
 4.5 Special Hazards of Combustion Products: Not pertinent  
 4.6 Behavior in Fire: Not pertinent  
 4.7 Auto Ignition Temperature: 842°F (dust cloud)  
 4.8 Electrical Hazards: Not pertinent  
 4.9 Burning Rate: Not pertinent  
 4.10 Adiabatic Flame Temperature: Currently not available  
 4.11 Stoichiometric Air to Fuel Ratio: 28.6 (calc.)  
 4.12 Flame Temperature: Currently not available  
 4.13 Combustion Molar Ratio (Reactant to Product): 11.0 (calc.)  
 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
 5.2 Reactivity with Common Materials: No reaction  
 5.3 Stability During Transport: Stable  
 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
 5.5 Polymerization: Not pertinent  
 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
 6.2 Waterfowl Toxicity: Currently not available  
 6.3 Biological Oxygen Demand (BOD): Currently not available  
 6.4 Food Chain Concentration Potential: None  
 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Technical: 86-90% plus 10-14% dimer. Pure: 98+%  
 7.2 Storage Temperature: Ambient  
 7.3 Inert Atmosphere: No requirement  
 7.4 Venting: Open  
 7.5 IMO Pollution Category: Currently not available  
 7.6 Ship Type: Currently not available  
 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
 8.2 49 CFR Class: Not pertinent  
 8.3 49 CFR Package Group: Not listed.  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification: Not listed  
 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Solid  
 9.2 Molecular Weight: 136.2  
 9.3 Boiling Point at 1 atm: Not pertinent (sublimes)  
 9.4 Freezing Point: 502°F = 261°C = 534°K  
 9.5 Critical Temperature: Not pertinent  
 9.6 Critical Pressure: Not pertinent  
 9.7 Specific Gravity: 1.39 at 25°C (solid)  
 9.8 Liquid Surface Tension: Not pertinent  
 9.9 Liquid Water Interfacial Tension: Not pertinent  
 9.10 Vapor (Gas) Specific Gravity: Not pertinent  
 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
 9.12 Latent Heat of Vaporization: Not pertinent  
 9.13 Heat of Combustion: -8,730 Btu/lb = -4,850 cal/g = -203 X 10<sup>3</sup> J/kg  
 9.14 Heat of Decomposition: Not pertinent  
 9.15 Heat of Solution: Not pertinent  
 9.16 Heat of Polymerization: Not pertinent  
 9.17 Heat of Fusion: Currently not available  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# PENTAERYTHRITOL

PET

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	1.974		N		N		N
36	2.218		O		O		O
38	2.463		T		T		T
40	2.707						
42	2.952		P		P		P
44	3.196		E		E		E
46	3.441		R		R		R
48	3.685		T		T		T
50	3.929		I		I		I
52	4.174		N		N		N
54	4.418		E		E		E
56	4.663		N		N		N
58	4.907		E		E		E
60	5.152		N		N		N
62	5.396		T		T		T
64	5.641						
66	5.885						
68	6.129						
70	6.374						
72	6.618						
74	6.863						
76	7.107						
78	7.352						
80	7.596						
82	7.841						
84	8.085						

# PARAFORMALDEHYDE

PFA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Formaldehyde polymer Polyformaldehyde Polyoxymethylene Polyoxymethylene glycol	Solid powder      White      Irritating odor  Sinks and mixes with water.
<b>Keep people away.</b> <b>Avoid contact with solid, dust and vapor.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Wear goggles and self-contained breathing apparatus. Extinguish with water, foam, dry chemical or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
<b>Water Pollution</b>	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{HO}(\text{CH}_2\text{O})_n\text{H}$   
2.3 IMO/UN Designation: 9.0/2213  
2.4 DOT ID No.: 2213  
2.5 CAS Registry No.: 30525-89-4  
2.6 NAERG Guide No.: 133  
2.7 Standard Industrial Trade Classification: 51622

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; protective clothing.  
3.2 **Symptoms Following Exposure:** Vapor or dust irritates eyes, mucous membranes, and skin; may cause dermatitis. Ingestion of solid or of a solution in water irritates mouth, throat, and stomach and may cause death.  
3.3 **Treatment of Exposure:** INGESTION: give milk or white of egg beaten with water; call a doctor. SKIN OR EYES: rinse with copious amounts of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 199°F (approx.) O.C.; 160°F (approx.) C.C.  
4.2 **Flammable Limits in Air:** (formaldehyde gas) 7.0%-73.0%  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Changes to formaldehyde gas, which is highly flammable.  
4.7 **Auto Ignition Temperature:** 572°F (approx.)  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** Forms water solution of formaldehyde.  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Slowly decomposes to formaldehyde gas.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** 32 ppm/24 hr/catfish/TL<sub>50</sub>/fresh water  
100-300 ppm/48 hr/flounder/TL<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 37%, 5 days; (theor.) 47%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 91-99%, powder and flake  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable solid  
8.2 49 CFR Class: 4.1  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 1,000 pounds.  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 600 (approx.)  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** 311–342°F = 155–172°C = 428–445°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.46 at 15°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** –6682 Btu/lb = –3712 cal/g = –155.4 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** –150 Btu/lb = –83.5 cal/g = –3.50 X 10<sup>3</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

PARAFORMALDEHYDE

PFA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT PERTINENT		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	INSOLUBLE UNLESS HOT		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

# PYROGALLIC ACID

PGA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2,3-Benzenetriol Pyrogallol 1,2,3-Trihydroxybenzene	Solid  White to Gray  Odorless   Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 1, 2, 3-CaH<sub>3</sub>(OH)<sub>3</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 87-66-1  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; safety goggles; dust mask  
3.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion may cause severe gastrointestinal irritation, convulsions, circulatory collapse, and death. Contact with eyes causes irritation. Skin contact can cause local discoloration, irritation, eczema, and death; repeated contact can cause sensitization.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. INGESTION: give large amount of water; induce vomiting immediately; consult a physician. EYES: flush with water for at least 15 min.; consult a physician. SKIN: wash immediately with soap and water; consult a physician if exposure has been severe.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 789 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Depresses growth in chicks  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
18 ppm/48 hr/goldfish/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
1.6%, 5 days  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** N.F.; Reagent  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 126  
9.3 **Boiling Point at 1 atm:** 588°F = 309°C = 582°K  
9.4 **Freezing Point:** 268°F = 131°C = 404°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.45 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -9,130 Btu/lb = -5,070 cal/g = -212 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PYROGALLIC ACID

PGA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	60.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# POLYPROPYLENE GLYCOL

PGC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Pluracol polyol Polyoxypropylene glycol Polyoxypropylene glycol Polypropylene glycols P400 to P4000 Thanol PPG	Liquid  Colorless  Odorless or mild sweet odor  May float or sink in water.
<b>Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to eyes. Harmful if swallowed. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ether  
2.2 Formula: where  $n = 2-34$   
 $\text{HOCH}(\text{CH}_3)\text{CH}_2\text{O}(\text{CH}_2\text{CH}(\text{CH}_3)\text{O})_n\text{H}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51229

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Safety glasses or face shield; rubber gloves  
3.2 Symptoms Following Exposure: The compound has a very low toxicity; few, if any, symptoms will be observed. Contact of liquid with eyes causes slight transient pain and irritation similar to that caused by a mild soap.  
3.3 Treatment of Exposure: EYES: flush with water until mild irritation is gone.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: (depends on molecular wt.) Grade 2; oral  $\text{LD}_{50} = 2,150 \text{ mg/kg}$  (rat) Grade 1;  $\text{LD}_{50}$  5 to 15 g/kg Grade 0;  $\text{LD}_{50} > 15 \text{ g/kg}$   
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 390–495°F O.C.  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Water, dry chemical, foam, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Low mol. wt. (miscible with water) Medium mol. wt. (2% soluble in water) High mol. wt. (insoluble in water)  
7.2 Storage Temperature: Below 140°F  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCL List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Variable-200 to 2000  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: –22 to –58°F = –30 to –50°C = 243 to 223°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.012 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: –14,200 Btu/lb = –7,900 cal/g = –330 X 10<sup>6</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

NOTES

# POLYPROPYLENE GLYCOL

PGC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	64.230	34	0.450	52	1.129		N O T  P E R T I N E N T
36	64.160	36	0.450	54	1.129		
38	64.089	38	0.450	56	1.129		
40	64.020	40	0.450	58	1.129		
42	63.950	42	0.450	60	1.129		
44	63.880	44	0.450	62	1.129		
46	63.810	46	0.450	64	1.129		
48	63.740	48	0.450	66	1.129		
50	63.670	50	0.450	68	1.129		
52	63.600	52	0.450	70	1.129		
54	63.530	54	0.450	72	1.129		
56	63.460	56	0.450	74	1.129		
58	63.390	58	0.450	76	1.129		
60	63.320	60	0.450	78	1.129		
62	63.250	62	0.450	80	1.129		
64	63.190	64	0.450	82	1.129		
66	63.120	66	0.450	84	1.129		
68	63.050	68	0.450	86	1.129		
70	62.980	70	0.450				
72	62.910	72	0.450				
74	62.840	74	0.450				
76	62.770	76	0.450				
78	62.700	78	0.450				
80	62.630	80	0.450				
82	62.560	82	0.450				
84	62.490	84	0.450				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E  T O  I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# POLYPROPYLENE GLYCOL METHYL ETHER

PGM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Polyoxypropylene glycol methyl ether Poly (propylene glycol) methyl ether	Liquid  Colorless  Odorless  Mixes with water.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ether  
2.2 Formula:  $\text{CH}_3\text{O}(\text{C}_3\text{H}_6\text{O})_n\text{H}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 37286-64-9  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield.  
3.2 **Symptoms Following Exposure:** Low toxicity. In high concentrations may be mildly anesthetic. Direct eye contact produces slight irritation.  
3.3 **Treatment of Exposure:** Remove victim from exposure.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Hazard to skin considered minor.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Currently not available  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Currently not available  
9.3 **Boiling Point at 1 atm:** Very high  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) 0.90 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.066  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -12,300 Btu/lb = -6860 cal/g = -287 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# POLYPROPYLENE GLYCOL METHYL ETHER

PGM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	56.180	50	0.478		N		N
52	56.180	52	0.478		O		O
54	56.180	54	0.478		T		T
56	56.180	56	0.478				
58	56.180	58	0.478		P		P
60	56.180	60	0.478		E		E
62	56.180	62	0.478		R		R
64	56.180	64	0.478		T		T
66	56.180	66	0.478		I		I
68	56.180	68	0.478		N		N
70	56.180	70	0.478		E		E
72	56.180	72	0.478		N		N
74	56.180	74	0.478		T		T
76	56.180	76	0.478				
78	56.180	78	0.478				
80	56.180	80	0.478				
82	56.180	82	0.478				
84	56.180	84	0.478				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# PROPYLENE GLYCOL METHYL ETHER ACETATE

PGN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Methoxy-2-propanol acetate	Liquid	Colorless	Sweet, ether-like odor
Shut off ignition sources and call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Wear full protective clothing and self-contained breathing apparatus. Extinguish with water spray, dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move to fresh air.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, induce vomiting after drinking two glasses of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CH}_3\text{COOCH}(\text{CH}_3)\text{CH}_2\text{OCH}_3$
- 2.3 IMO/UN Designation: Not listed.
- 2.4 DOT ID No.: Not listed.
- 2.5 CAS Registry No.: 108-65-6
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety goggles, protective clothing. Use approved respirator when possibility exists of encountering vapor.
- 3.2 **Symptoms Following Exposure:** No significant adverse effects expected.
- 3.3 **Treatment of Exposure:** Call for medical aid. EYES: Wash with water for 15 min.; call a physician. SKIN: Remove contaminated clothing and wash skin with soap and water. INGESTION: Induce vomiting after drinking two glasses of water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1;  $\text{LD}_{50} = > 10 \text{ g/kg (rat)}$
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 114°F O.C.
- 4.2 **Flammable Limits in Air:** LEL: 1.3% @ 173°F; UEL: 13.1% @ 283°F.
- 4.3 **Fire Extinguishing Agents:** Water spray, alcohol foam, dry chemical, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.
- 4.5 **Special Hazards of Combustion Products:** Carbon dioxide and carbon monoxide may form when heated to decomposition.
- 4.6 **Behavior in Fire:** Not pertinent.
- 4.7 **Auto Ignition Temperature:** 670°F.
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Incompatible with oxidizers.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%; technical.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Not listed.
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 132.16
- 9.3 **Boiling Point at 1 atm:** 302°F = 150°C = 423°K
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.969 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PROPYLENE GLYCOL METHYL ETHER ACETATE

PGN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	8.090		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E	68	0.072	68	0.00167		C U R R E N T L Y  N O T  A V A I L A B L E

# PROPYLENE GLYCOL ETHYL ETHER

PGY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Ethoxy-2-propanol	Liquid	Colorless
Shut off ignition sources and call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.		
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 40; Glycol ethers  
2.2 **Formula:** CH<sub>3</sub>CH<sub>2</sub>OCH<sub>2</sub>CH<sub>2</sub>OHCH<sub>3</sub>  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** 1569-02-4  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator; rubber gloves; goggles; clothing to prevent body contact with liquid.  
3.2 **Symptoms Following Exposure:** Vapors irritate eyes and nose.  
3.3 **Treatment of Exposure:** Call for medical aid. **INHALATION:** Remove to fresh air. **SKIN OR EYES:** Immediately flush with plenty of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 4.4 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Can cause corneal damage. Inhalation or skin contact can cause toxic effects.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Alcohol foam, water spray, dry chemical or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.  
4.5 **Special Hazards of Combustion Products:** Carbon dioxide and carbon monoxide may be produced in a fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 34.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Incompatible with oxidizing materials.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 104.15  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PROPYLENE GLYCOL ETHYL ETHER

PGY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.329 0.341 0.353 0.364 0.376 0.387 0.398 0.408 0.419 0.429 0.439 0.449 0.459 0.469 0.479 0.488 0.497 0.506 0.515 0.525 0.532 0.540 0.549 0.557 0.565



# PHOSDRIN

PHD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Menite Mevinphos Phosfene	Liquid  Sinks and mixes with water.	Yellow to orange  Mild to none
Evacuate. Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR OR LIQUID. POISONOUS IF SWALLOWED, INHALED, OR IF SKIN IS EXPOSED. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** C<sub>7</sub>H<sub>13</sub>O<sub>3</sub>P  
(CH<sub>3</sub>O)<sub>2</sub>(P=O)OC(CH<sub>3</sub>)=CHCOOCH<sub>3</sub>  
2.3 **IMO/UN Designation:** 6.1/2783  
2.4 **DOT ID No.:** 3018  
2.5 **CAS Registry No.:** 7786-34-7  
2.6 **NAERG Guide No.:** 152  
2.7 **Standard Industrial Trade Classification:** 51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear protective clothing, rubber gloves, and breathing apparatus.  
3.2 **Symptoms Following Exposure:** INHALATION, INGESTION, OR ABSORPTION THROUGH SKIN:  
Symptoms secondary to cholinesterase inhibition: headache, giddiness, nervousness, blurred vision, weakness, nausea, cramps, diarrhea, chest discomfort. Signs are sweating, miosis, tearing, salivation and other respiratory tract secretion, vomiting, cyanosis, papilledema and uncontrollable muscle twitches. Convulsions, coma, loss of reflexes, and loss of sphincter control are seen only in advanced cases.  
3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove from exposure. Give artificial respiration and oxygen. Give 2 mg atropine IM every 15 minutes until effect becomes apparent. EYES: Flush thoroughly with water. SKIN: Wash with soap and water. INGESTION: Gastric lavage followed by saline catharsis.  
3.4 **TLV-TWA:** 0.01 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 0.03 ppm  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> = below 50 mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Positive teratogenicity at 10 mg in hen eggs. Cholinesterase - inhibition persists for 2 to 6 weeks making subsequent exposures produce more severe symptoms.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 4 ppm  
3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup>  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 175°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Currently not available  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Highly toxic fumes are imminent.  
4.6 **Behavior in Fire:** Emits highly toxic fumes.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Hydrolyzes rapidly.  
5.2 **Reactivity with Common Materials:**  
Corrosive to many metals.  
5.3 **Stability During Transport:** Stable when anhydrous.  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Fresh water  
0.014 ppm/48-hour/Rainbow trout/LC<sub>50</sub>  
0.034 ppm/24-hour/Rainbow trout/LC<sub>50</sub>  
0.037 ppm/48-hour/Bluegill/LC<sub>50</sub>  
0.04 ppm/24-hour/Bluegill/LC<sub>50</sub>  
Saltwater  
0.040 ppm/24-hour/Hermit crab/LC<sub>50</sub>  
0.013 ppm/24-hour/Sand shrimp/LC<sub>50</sub>  
6.2 **Waterfowl Toxicity:** 4.6 mg/kg/Young mallard/LD<sub>50</sub>/Oral  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Low, Highly soluble, Hydrolyzes rapidly, nonpersistent.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical >60% alpha isomer; 25% and 50% concentrates; 25% water soluble solutions; 1 and 2% dusts and granules  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 224.16  
9.3 **Boiling Point at 1 atm:** 617°F = 325°C = 598.2°K  
9.4 **Freezing Point:** -68.8°F = -56°C = 217.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.25 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 7.73 (calculated)  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PHOSDRIN

PHD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	78.030		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	77	8.280

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# PHENYLHYDRAZINE

PHE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hydrazine-benzene Hydrazinobenzene Phenylhydrazine hydrochloride Phenylhydrazinium chloride	Solid crystals or oily liquid Pale yellow Faint aromatic odor
<b>Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide, or large quantities of coarse water spray.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID or SOLID Toxic. May be fatal if swallowed. Corrosive to skin and eyes. Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** C<sub>6</sub>H<sub>5</sub>NHNH<sub>2</sub>  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** 2572  
2.5 **CAS Registry No.:** 100-63-0  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51486

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Material is corrosive to tissue. Exposure can cause vomiting, diarrhea, fatigue, headache, and irritation and itchiness of the eyes and skin.
- 3.3 **Treatment of Exposure:** Get medical attention. Toxic. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. Contact lenses should not be worn when working with this chemical. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.
- 3.4 **TLV-TWA:** 0.1 ppm.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral rat LD<sub>50</sub> = 188 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Repeated skin contact can cause skin sensitization and eczematous dermatitis with redness, swelling, and rash. Chronic and acute exposures may produce blood effects, live and kidney damage.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 15 ppm  
3.14 **OSHA PEL-TWA:** 5 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 190°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide, or large quantities of coarse water spray.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as nitrogen oxides and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** May ignite spontaneously when spread on a large surface or when in air and in contact with porous materials such as soil, asbestos, wood, or cloth.  
4.7 **Auto Ignition Temperature:** 345°F.  
4.8 **Electrical Hazards:** Will attack cork, some forms of plastics, coatings, and rubber (insulators).  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 47.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** May ignite spontaneously when in contact with oxidants such as hydrogen peroxide or nitric acid, oxides of iron or copper, or manganese, lead, copper or their alloys.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%; technical.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 108.16  
9.3 **Boiling Point at 1 atm:** 471°F = 243.5°C = 516.5°K (with decomposition)  
9.4 **Freezing Point:** 68°F = 19.6°C = 292.6°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.0978  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.7  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PHENYLHYDRAZINE

PHE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E	77 161	0.001 0.019	77 161	0.00001 0.00031		C U R R E N T L Y  N O T  A V A I L A B L E

# PHOSGENE

PHG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carbonyl chloride Chloroformyl chloride	Liquefied compressed gas  Colorless gas, or light yellow liquid  Sweet or sharp odor  Liquid sinks in water. Poisonous vapor is produced. Boiling point is 47°F.
<b>Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles and self-contained breathing apparatus. Evacuate area in case of large discharge. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus. Cool exposed containers and protect men effecting shutoff with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose, and throat. Effects may be delayed. Move to fresh air. If breathing has stopped, give artificial respiration (but NOT mouth-to-mouth). If breathing is difficult, give oxygen. Maintain absolute rest until medical aid arrives.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: COCl<sub>2</sub>  
2.3 IMO/UN Designation: 2.0/1076  
2.4 DOT ID No.: 1076  
2.5 CAS Registry No.: 75-44-5  
2.6 NAERG Guide No.: 125  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved U.S. Bureau of Mines respirator; protective clothing.  
3.2 **Symptoms Following Exposure:** Irritates lungs, causing delayed pulmonary edema. Slight gassing produces dryness or burning sensation in the throat, numbness, pain in the chest, bronchitis, and shortness of breath.  
3.3 **Treatment of Exposure:** INHALATION: remove victim from contaminated area; enforce absolute rest; call a doctor.  
3.4 **TLV-TWA:** 0.1 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Not pertinent  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Severe delayed pulmonary edema.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe irritant to all tissues.  
3.12 **Odor Threshold:** 0.5 ppm  
3.13 **IDLH Value:** 2 ppm  
3.14 **OSHA PEL-TWA:** 0.1 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Water to cool containers  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic gas is generated when heated.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Decomposes, but not vigorously.  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Can be absorbed in caustic soda solution. One ton of phosgene requires 2,480 lbs. of caustic soda dissolved in 1000 gal. of water.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: -  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; 100%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison gas  
8.2 **49 CFR Class:** 2.3  
8.3 **49 CFR Package Group:** Not pertinent.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	0
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** P095  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
9.2 **Molecular Weight:** 98.92  
9.3 **Boiling Point at 1 atm:** 46.8°F = 8.2°C = 281.4°K  
9.4 **Freezing Point:** -195°F = -126°C = 147°K  
9.5 **Critical Temperature:** 359.6°F = 182°C = 455.2°K  
9.6 **Critical Pressure:** 823 psia = 56.0 atm = 5.67 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.38 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 22.8 dynes/cm = 0.0228 N/m at 0°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.170  
9.12 **Latent Heat of Vaporization:** 110 Btu/lb = 59 cal/g = 2.5 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PHOSGENE

PHG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	89.009	0	0.250		N		N
40	88.570	5	0.250		O		O
45	88.139	10	0.250		T		T
		15	0.250				
		20	0.250		P		P
		25	0.250		E		E
		30	0.250		R		R
		35	0.250		T		T
		40	0.250		I		I
		45	0.250		N		N
					E		E
					N		N
					E		E
					N		N
					T		T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	50	15.710	50	0.28400	0	0.132
	E	60	19.260	60	0.34160	25	0.134
	A	70	23.440	70	0.40770	50	0.137
	C	80	28.310	80	0.48340	75	0.139
	T	90	33.960	90	0.56930	100	0.142
	S	100	40.480	100	0.66640	125	0.144
		110	47.940	110	0.77560	150	0.146
		120	56.460	120	0.89760	175	0.148
		130	66.120	130	1.03300	200	0.150
		140	77.030	140	1.18400	225	0.152
		150	89.290	150	1.35000	250	0.154
		160	103.000	160	1.53200	275	0.155
		170	118.299	170	1.73100	300	0.157
		180	135.299	180	1.94900	325	0.159
		190	154.000	190	2.18500	350	0.160
		200	174.699	200	2.44100	375	0.161
		210	197.400	210	2.71700	400	0.163
						425	0.164
						450	0.165
						475	0.166
						500	0.167
						525	0.167
						550	0.168
						575	0.169
						600	0.169

# PHENYLHYDRAZINE HYDROCHLORIDE

PHH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Phenylhydrazinium chloride	Solid  White to tan  Weak odor  Sinks and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_6H_5NH-NH_2 \cdot HCl$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51486

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; rubber gloves; goggles
- 3.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat; fumes from hot material may cause same symptoms as ingestion. Phenylhydrazine is a chronic poison; ingestion can cause jaundice, anorexia, nausea, and vascular thrombosis; may also cause anemia and liver injury. Contact with eyes causes irritation. Contact with skin causes irritation and dermatitis.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air; get medical attention. INGESTION: give large amount of water; induce vomiting; get medical attention. EYES: flush with water for at least 15 min.; if exposure is prolonged or repeated, get medical attention. SKIN: flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes tumors in mice
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating oxides of nitrogen and hydrogen chloride may form in fire.
- 4.6 **Behavior in Fire:** The solid may sublime without melting and deposit on cool surfaces.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** May be corrosive to metals
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; Pure
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 144.6
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:**  $469^{\circ}F = 243^{\circ}C = 516^{\circ}K$
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:**  $>1$  at  $20^{\circ}C$  (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PHENYLHYDRAZINE HYDROCHLORIDE

PHH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T



# PHENOL

PHN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carbolic acid Hydroxybenzene Phenic acid Phenyl hydroxide	Solid crystals; or watery liquid  White solid, or light pink liquid  Sweet tarry odor  May float or sink, and mixes slowly with water.
<b>Keep people away. AVOID CONTACT WITH LIQUID AND SOLID. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Evacuate area in case of large discharge. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, carbon dioxide, dry chemical, or foam. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 21; Phenol, cresol 2.2 Formula: C <sub>6</sub> H <sub>5</sub> OH 2.3 IMO/UN Designation: 9.0/1671 2.4 DOT ID No.: 1671 2.5 CAS Registry No.: 108-95-2 2.6 NAERG Guide No.: 153 2.7 Standard Industrial Trade Classification: 51241
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Fresh-air mask for confined areas; rubber gloves; protective clothing; full face shield. 3.2 <b>Symptoms Following Exposure:</b> Will burn eyes and skin. The analgesic action may cause loss of pain sensation. Readily absorbed through skin, causing increase in heart rate, convulsions, and death. 3.3 <b>Treatment of Exposure:</b> INHALATION: if victim shows any ill effects, move him to fresh air, keep him quiet and warm, and call a doctor immediately; if breathing stops, give artificial respiration. INGESTION: do NOT induce vomiting; give milk, egg whites, or large amounts of water and call doctor immediately; no known antidote; treat the symptoms. EYES: immediately flush with plenty of water for at least 15 min.; continue for another 15 min. if doctor has not taken over. SKIN: immediately remove all clothing while in a shower and wash affected area with abundant flowing water or soap and water for at least 15 min.; clean clothing thoroughly or discard. 3.4 <b>TLV-TWA:</b> 5 ppm 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2: LD <sub>50</sub> = 0.5 to 5 g/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Carcinogenic in laboratory animals 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 3.11 <b>Liquid or Solid Characteristics:</b> Fairly severe skin irritant; may cause pain and second- degree burns after a few minutes' contact. 3.12 <b>Odor Threshold:</b> 0.05 ppm 3.13 <b>IDLH Value:</b> 250 ppm 3.14 <b>OSHA PEL-TWA:</b> 5 ppm 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 185°F O.C. 175°F C.C.  
4.2 **Flammable Limits in Air:** 1.7%-8.6%  
4.3 **Fire Extinguishing Agents:** Water fog, foam, carbon dioxide, or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic and irritating vapors are generated when heated.  
4.6 **Behavior in Fire:** Yields flammable vapors when heated which will form explosive mixtures with air.  
4.7 **Auto Ignition Temperature:** 1319°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 3.5 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
11.5-28.5 mg/l/96 hr/bluegill/TL<sub>m</sub>/fresh water  
1.5 ppm/48 hr/rainbow trout/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 200%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 90-99% (solid), 60-85% (liquid). Technical: 82-92% (contains cresols)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 1

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** U188  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid or liquid  
9.2 **Molecular Weight:** 94.11  
9.3 **Boiling Point at 1 atm:** 359.2°F = 181.8°C = 455.0°K  
9.4 **Freezing Point:** 105.6°F = 40.9°C = 314.1°K  
9.5 **Critical Temperature:** 790.0°F = 421.1°C = 694.3°K  
9.6 **Critical Pressure:** 889 psia = 60.5 atm = 6.13 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.058 at 41°C (liquid)  
9.8 **Liquid Surface Tension:** 36.5 dynes/cm = 0.0365 N/m at 55°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 20 dynes/cm = 0.02 N/m at 42°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.089  
9.12 **Latent Heat of Vaporization:** 130 Btu/lb = 72 cal/g = 3.0 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -13,400 Btu/lb = -7,445 cal/g = -311.7 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.3 psia

## NOTES

# PHENOL

PHN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
110	65.870	108	0.561	122	1.113	110	4.302
115	65.719	109	0.561			115	3.929
120	65.559	110	0.561			120	3.594
125	65.410	111	0.561			125	3.292
130	65.250	112	0.561			130	3.021
135	65.099	113	0.561			135	2.775
140	64.940	114	0.561			140	2.554
145	64.790	115	0.561			145	2.353
150	64.629	116	0.561			150	2.171
155	64.469	117	0.561			155	2.005
160	64.309	118	0.561			160	1.855
165	64.160	119	0.561			165	1.718
170	64.000	120	0.561			170	1.593
175	63.840	121	0.561			175	1.479
180	63.670	122	0.561				
185	63.510	123	0.561				
190	63.350	124	0.561				
195	63.190	125	0.561				
200	63.020	126	0.561				
205	62.860	127	0.561				
210	62.690	128	0.561				
		129	0.561				
		130	0.561				
		131	0.561				
		132	0.561				
		133	0.561				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	8.400	70	0.012	70	0.00019	0	0.224
		80	0.017	80	0.00027	25	0.237
		90	0.024	90	0.00039	50	0.250
		100	0.034	100	0.00054	75	0.262
		110	0.048	110	0.00074	100	0.274
		120	0.066	120	0.00100	125	0.286
		130	0.091	130	0.00135	150	0.297
		140	0.123	140	0.00180	175	0.309
		150	0.165	150	0.00238	200	0.319
		160	0.220	160	0.00311	225	0.330
		170	0.289	170	0.00403	250	0.341
		180	0.378	180	0.00518	275	0.351
		190	0.490	190	0.00661	300	0.360
		200	0.629	200	0.00836	325	0.370
		210	0.802	210	0.01050	350	0.379
		220	1.016	220	0.01311	375	0.388
		230	1.278	230	0.01624	400	0.397
		240	1.596	240	0.02000	425	0.405
		250	1.982	250	0.02449	450	0.414
		260	2.446	260	0.02980	475	0.422
		270	3.002	270	0.03607	500	0.429
		280	3.663	280	0.04342	525	0.436
		290	4.446	290	0.05200	550	0.444
		300	5.370	300	0.06197	575	0.450
		310	6.453	310	0.07350	600	0.457
		320	7.718	320	0.08679		

# PROPYLENEIMINE

PII

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Methylaziridine 2-Methylethyleneimine	Liquid  Colorless  Strong ammonia-like odor  Mixes with water. Flammable, irritating vapor is produced.
Evacuate. KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR. Wear rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Irritating gases are produced when heated. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Combat fires from safe distance or protected location. Extinguish with dry chemicals or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause nausea, vomiting or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{NH}_2\text{CH}_2\text{CH}(\text{NH}_2)\text{CH}_3$   
2.3 IMO/UN Designation: 3.2/1921  
2.4 DOT ID No.: 1921  
2.5 CAS Registry No.: 75-55-8  
2.6 NAERG Guide No.: 131P  
2.7 Standard Industrial Trade Classification: 51453

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; goggles or face shield; rubber gloves
- 3.2 **Symptoms Following Exposure:** Inhalation causes vomiting, breathing difficulty, and irritation of eyes, nose, and throat; on prolonged exposure, vapors tend to redden the whites of the eyes. Contact with liquid causes eye irritation, like that caused by strong ammonia. Liquid causes skin burns, which are slow to heal. Ingestion causes burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: move victim to fresh air; if he is not breathing, apply artificial respiration, oxygen; if breathing is difficult, administer oxygen; call physician. EYES: flush with plenty of water for at least 30 min. and obtain prompt medical attention. SKIN: remove all contaminated clothing and flush with water; rinse with vinegar and water. INGESTION: drink large amounts of milk or water; get prompt medical attention.
- 3.4 TLV-TWA: 2 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 4; oral  $\text{LD}_{50}$  = 19 mg/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Not pertinent  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 100 ppm  
3.14 OSHA PEL-TWA: 2 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: 92°F O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may be ineffective.  
4.5 Special Hazards of Combustion Products: Irritating nitrogen oxides are produced.  
4.6 Behavior in Fire: Containers may explode.  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: 4.1 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 27.4 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 7.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts slowly to form propanolamine. The reaction is not hazardous.  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable if kept in contact with solid caustic soda (sodium hydroxide)  
5.4 Neutralizing Agents for Acids and Caustics: Dilute with water, rinse with vinegar  
5.5 Polymerization: Polymerizes explosively when in contact with any acid  
5.6 Inhibitor of Polymerization: Solid sodium hydroxide (caustic soda)

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Exclude air  
7.4 Venting: Pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 1 pound.  
8.7 EPA Pollution Category: X  
8.8 RCRA Waste Number: U067  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 57.1  
9.3 Boiling Point at 1 atm: 151°F = 66°C = 339°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.802 at 25°C (liquid)  
9.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 2  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: 250 Btu/lb = 139 cal/g = 5.82 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: (est.) -15,500 Btu/lb = -8,600 cal/g = -360 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: -140 Btu/lb = -78 cal/g = -3.3 X 10<sup>5</sup> J/kg  
9.16 Heat of Polymerization: (est.) -720 Btu/lb = -400 cal/g = -17 X 10<sup>5</sup> J/kg  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# PROPYLENEIMINE

PII

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	51.520	51	0.411	51	1.048	52	0.470
40	51.350	52	0.411	52	1.048	54	0.465
45	51.170	53	0.412	53	1.048	56	0.461
50	51.000	54	0.412	54	1.048	58	0.457
55	50.830	55	0.413	55	1.048	60	0.452
60	50.650	56	0.413	56	1.048	62	0.448
65	50.480	57	0.414	57	1.048	64	0.444
70	50.310	58	0.414	58	1.048	66	0.440
75	50.130	59	0.415	59	1.048	68	0.436
80	49.960	60	0.416	60	1.048	70	0.432
85	49.790	61	0.416	61	1.048	72	0.428
90	49.610	62	0.417	62	1.048	74	0.424
95	49.440	63	0.417	63	1.048	76	0.421
100	49.260	64	0.418	64	1.048	78	0.417
105	49.090	65	0.418	65	1.048	80	0.413
110	48.920	66	0.419	66	1.048	82	0.410
115	48.740	67	0.419	67	1.048	84	0.406
120	48.570	68	0.420	68	1.048	86	0.403
		69	0.421	69	1.048		
		70	0.421	70	1.048		
		71	0.422	71	1.048		
		72	0.422	72	1.048		
		73	0.423	73	1.048		
		74	0.423	74	1.048		
		75	0.424	75	1.048		
		76	0.424	76	1.048		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	55	1.516	55	0.01567	0	0.307
	I	60	1.742	60	0.01783	25	0.324
	S	65	1.997	65	0.02025	50	0.340
	C	70	2.284	70	0.02294	75	0.356
	I	75	2.605	75	0.02592	100	0.371
	B	80	2.964	80	0.02922	125	0.386
	L	85	3.365	85	0.03286	150	0.401
	E	90	3.811	90	0.03688	175	0.416
		95	4.306	95	0.04129	200	0.430
		100	4.855	100	0.04614	225	0.444
		105	5.462	105	0.05146	250	0.458
		110	6.133	110	0.05727	275	0.471
		115	6.872	115	0.06361	300	0.484
	R	120	7.685	120	0.07052	325	0.497
	E	125	8.578	125	0.07804	350	0.509
	A	130	9.557	130	0.08621	375	0.521
	C	135	10.630	135	0.09507	400	0.533
	T	140	11.800	140	0.10470	425	0.545
	S	145	13.080	145	0.11500	450	0.556
		150	14.470	150	0.12620	475	0.567
		155	15.980	155	0.13830	500	0.578
						525	0.588
						550	0.598
						575	0.608
						600	0.618

# PINENE

PIN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Australene 2-Pinene alpha-Pinene 2,6,6-Trimethylbicyclo [3.1.1]hept-2-ene, 9cl	Oily liquid Colorless Turpentine odor  Floats on water.
<p>Keep people away.  Shut off ignition sources and call fire department.  Evacuate area.  Avoid contact with liquid and vapor.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	COMBUSTIBLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective on fire. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	May be dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula: C<sub>10</sub>H<sub>16</sub>  
2.3 IMO/UN Designation: 3.3/2368  
2.4 DOT ID No.: 2368  
2.5 CAS Registry No.: 80-56-8  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification:  
51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus and protective clothing, rubber boots, and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** Harmful if swallowed, inhaled or absorbed through skin. High concentrations are extremely destructive to mucous membrane and upper respiratory tract, eyes and skin. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting.
- 3.3 **Treatment of Exposure:** INHALATION: Call a physician. Remove the victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES - OR - SKIN: Immediately flush with copious amount of water for at least 15 minutes while removing contaminated clothing and shoes. Assure adequate flushing of the eyes by holding eyelids open with the fingers.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 91°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam, water sprays.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Vapor may travel considerable distance to source of ignition and flashback. Container explosion may occur during fire conditions. Forms explosive mixtures in air.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** 491°F.
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 66.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** No reaction.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Not pertinent.
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable Liquid
- 8.2 49 CFR Class: 3
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: Yes
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 1              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 136.26
- 9.3 Boiling Point at 1 atm: 311°F = 155°C = 428.16°K
- 9.4 Freezing Point: -58°F = -50°C = 223.2°K
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 0.858
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: 4.7
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Currently not available
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: .1991 psia

### NOTES

# PINENE

PIN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	30 76 99 125 152 170 194 230 270 311	0.019 0.097 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.313 0.330 0.347 0.364 0.381 0.397 0.413 0.428 0.443 0.458 0.472 0.486 0.499 0.513 0.526 0.538 0.551 0.563 0.574 0.586 0.597 0.608 0.618 0.629 0.639

# N-PROPANOLAMINE

PLA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 3-Amino-1-propanol 3-Propanolamine 1-Propanol, 3-amino	Liquid  Colorless to pale yellow  Fishy odor  Liquid floats and mixes with water.
<b>Keep people away. Avoid contact with vapor or liquid.</b> <b>Wear self-contained breathing apparatus and full protective clothing for emergency action.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible TOXIC FUMES PRODUCED AT DECOMPOSITION TEMPERATURE. Wear self-contained breathing apparatus and full protective clothing. Small fires: Dry chemical, CO <sub>2</sub> , water spray, or alcohol foam. Large fires: Water spray, fog, or alcohol foam. Cool exposed containers with water until fire is well out.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR May be harmful if inhaled. Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to eyes and skin. May cause burns. Remove and isolate contaminated clothing and shoes. IF IN EYES: hold eyelids open and flush with plenty of running water for at least 15 minutes. Flush other affected areas for at least 15 minutes with plenty of running water. Keep victim quiet and maintain normal body temperature.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 8; Alkanolamines  
2.2 Formula:  $\text{H}_2\text{NCH}_2\text{CH}_2\text{CH}_2\text{OH}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 156-87-6  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51467

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear butyl rubber gloves and face shield or all-purpose canister respirator for spills. Wear self-contained breathing apparatus and full protective clothing for fires.
- 3.2 **Symptoms Following Exposure:** If inhaled may be harmful. Contact may cause burns to skin and eyes. (Organic base.)
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. SKIN AND EYES: Immediately flush skin or eyes with running water for at least 15 minutes; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes. Maintain normal body temperature.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 2.8 \text{ g/kg (rat)}$
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will usually not tolerate moderate or high concentrations
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 175°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: Dry chemical, CO<sub>2</sub>, water spray or alcohol foam. Large fires: Water spray, fog or alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.
- 4.6 **Behavior in Fire:** May produce toxic oxides of nitrogen.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 27.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Cover spilled material with sodium bisulfate. Flush with water.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%, 99+%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** U194
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 75.11
- 9.3 **Boiling Point at 1 atm:** 369.5°F = 187.8°C = 460.5°K
- 9.4 **Freezing Point:** 52°F = 11°C = 284.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.982 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 2.6 (est)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N-PROPANOLAMINE

PLA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
78	61.330		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.381 0.390 0.399 0.408 0.417 0.426 0.435 0.444 0.452 0.461 0.470 0.479 0.488 0.497 0.506 0.515 0.524 0.533 0.542 0.551 0.560 0.569 0.578 0.587 0.595



# POLYBUTENE

PLB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butene resins Polyisobutylene plastics Polyisobutylene resins Polyisobutylene waxes	Oily liquid	Colorless	Odorless
Floats on water.			
Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	Not harmful.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $C(CH_3)_2CH_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification:  
51119

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield.  
3.2 Symptoms Following Exposure: Low toxicity. Vapor may act as a simple asphyxiant in high concentration.  
3.3 Treatment of Exposure: INHALATION: remove victim from exposure.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 0; LD<sub>50</sub> above 15 g/kg (animals)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat.  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 215-470°F O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical, or foam  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 28.6 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 8.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: 85%-98%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 225-2300  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.81-0.91 at 15°C (liquid)  
9.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -20,000 Btu/lb = -11,000 cal/g = -470 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: (est.) -9 Btu/lb = -5 cal/g = 0.2 X 10<sup>5</sup> J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# POLYBUTENE

PLB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	50.560	50	0.478	50	1.040	100	101.500
52	50.560	52	0.478	52	1.040		
54	50.560	54	0.478	54	1.040		
56	50.560	56	0.478	56	1.040		
58	50.560	58	0.478	58	1.040		
60	50.560	60	0.478	60	1.040		
62	50.560	62	0.478	62	1.040		
64	50.560	64	0.478	64	1.040		
66	50.560	66	0.478	66	1.040		
68	50.560	68	0.478	68	1.040		
70	50.560	70	0.478	70	1.040		
72	50.560	72	0.478	72	1.040		
74	50.560	74	0.478	74	1.040		
76	50.560	76	0.478	76	1.040		
78	50.560	78	0.478	78	1.040		
80	50.560	80	0.478	80	1.040		
82	50.560	82	0.478	82	1.040		
84	50.560	84	0.478	84	1.040		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	250	0.088	250	0.01157		N O T
		255	0.099	255	0.01296		
		260	0.112	260	0.01449		
		265	0.126	265	0.01618		P E R T I N E N T
		270	0.141	270	0.01803		
		275	0.158	275	0.02006		
		280	0.177	280	0.02229		
		285	0.198	285	0.02474		
		290	0.221	290	0.02741		
		295	0.246	295	0.03032		
		300	0.273	300	0.03350		
		305	0.303	305	0.03697		
		310	0.337	310	0.04074		
		315	0.373	315	0.04483		
		320	0.412	320	0.04928		
		325	0.456	325	0.05409		
		330	0.503	330	0.05931		
		335	0.554	335	0.06495		
		340	0.610	340	0.07104		
		345	0.670	345	0.07762		
		350	0.736	350	0.08471		
		355	0.807	355	0.09234		
		360	0.885	360	0.10060		
		365	0.968	365	0.10940		
		370	1.058	370	0.11880		
		375	1.156	375	0.12900		

# POLYPROPYLENE

PLP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Propene polymer	Solid	Tan to white	Odorless
	Floats on water.		
Call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Extinguish with water, dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	DUST Not harmful.  SOLID Not harmful.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $[\text{CH}(\text{CH}_3)-\text{CH}_2]_n$  where n is large  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Filter respirator  
3.2 Symptoms Following Exposure: No apparent toxicity  
3.3 Treatment of Exposure: None required  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Causes central bronchitis and peripheral bronchitis in rats and rabbits  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: Not pertinent (combustible solid)  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: None  
6.2 Waterfowl Toxicity: None  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Commercial, 100%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: Mixture  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.90 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -19,600 Btu/lb = -10,900 cal/g = -456 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# POLYPROPYLENE

PLP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# BETA-PROPIOLACTONE

PLT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Betraprone Hydracrylic acid, beta-lactone 2-Oxetanone Propanolide beta-Propionolactone	Liquid  Colorless  Irritating odor  Mixes with water.
<b>Evacuate.</b> <b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID.</b> <b>Wear rubber overclothing (including gloves).</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Containers may explode in fire. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:**  $\text{OCH}_2\text{CH}_2\text{CO}$   
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 57-57-8  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51628

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air mask or organic canister mask; goggles or face shield; rubber gloves; protective clothing to prevent all contact with skin.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of nose, throat, and respiratory tract. Contact of liquid with eyes causes irritation and tears. Contact with skin causes irritation and blistering. Ingestion causes burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound. INHALATION: move victim to fresh air; if breathing has stopped, give artificial respiration. EYES: flush continuously with water for at least 15 min. SKIN: flush with water; if blistering occurs, alert physician to fact that fluid from blister will cause additional blistering of adjacent skin. INGESTION: give large amount of water and induce vomiting.
- 3.4 **TLV-TWA:** 0.05 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral  $\text{LDL}_{50}$  = 50 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Because of the high incidence of cancer, either in man or animals, no exposure or contact by any route-respiratory, oral, or skin-should be permitted.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 165°F C.C.  
4.2 **Flammable Limits in Air:** 2.9% (LFL)  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Vapors of unburned material are very toxic.  
4.6 **Behavior in Fire:** Containers may explode.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 14.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Slow, non-hazardous reaction to form beta-hydroxypropionic acid  
5.2 **Reactivity with Common Materials:** Not pertinent  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Can polymerize and rupture container, especially at elevated temperatures. At 22°C, 0.04% polymerizes each day.  
5.6 **Inhibitor of Polymerization:** None used

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 2  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97+%  
7.2 **Storage Temperature:** Below 60°F  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 72.1  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** -28.1°F = -33.4°C = 239.8°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.148 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 22 dynes/cm = 0.022 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 2.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1089  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -8,510 Btu/lb = -4,730 cal/g = -198 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# BETA-PROPIOLACTONE

PLT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	72.959	42	0.406	51	1.048	51	0.954
36	72.900	44	0.407	52	1.048	52	0.945
38	72.830	46	0.408	53	1.048	53	0.937
40	72.759	48	0.409	54	1.048	54	0.928
42	72.690	50	0.410	55	1.048	55	0.920
44	72.620	52	0.411	56	1.048	56	0.912
46	72.549	54	0.412	57	1.048	57	0.904
48	72.480	56	0.413	58	1.048	58	0.896
50	72.410	58	0.414	59	1.048	59	0.888
52	72.339	60	0.416	60	1.048	60	0.880
54	72.270	62	0.417	61	1.048	61	0.872
56	72.200	64	0.418	62	1.048	62	0.865
58	72.129	66	0.419	63	1.048	63	0.857
60	72.059	68	0.420	64	1.048	64	0.850
62	71.990	70	0.421	65	1.048	65	0.842
64	71.919	72	0.422	66	1.048	66	0.835
66	71.849	74	0.423	67	1.048	67	0.828
68	71.790	76	0.424	68	1.048	68	0.821
70	71.719			69	1.048	69	0.814
72	71.650			70	1.048	70	0.807
74	71.580			71	1.048	71	0.800
76	71.509			72	1.048	72	0.794
78	71.440			73	1.048	73	0.787
80	71.370			74	1.048	74	0.780
82	71.299			75	1.048	75	0.774
84	71.230			76	1.048	76	0.768

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	68.000	88	0.089	88	0.00109	0	0.257
		90	0.093	90	0.00114	25	0.266
		92	0.098	92	0.00119	50	0.274
		94	0.103	94	0.00125	75	0.283
		96	0.108	96	0.00130	100	0.291
		98	0.113	98	0.00136	125	0.299
		100	0.118	100	0.00142	150	0.308
		102	0.124	102	0.00148	175	0.315
		104	0.130	104	0.00155	200	0.323
		106	0.136	106	0.00161	225	0.331
		108	0.142	108	0.00168	250	0.338
		110	0.149	110	0.00175	275	0.346
		112	0.155	112	0.00183	300	0.353
		114	0.162	114	0.00190	325	0.360
		116	0.170	116	0.00198	350	0.367
		118	0.177	118	0.00206	375	0.374
		120	0.185	120	0.00215	400	0.380
		122	0.193	122	0.00223	425	0.387
		124	0.202	124	0.00232	450	0.393
		126	0.210	126	0.00241	475	0.399
		128	0.220	128	0.00251	500	0.405
		130	0.229	130	0.00261	525	0.411
		132	0.239	132	0.00271	550	0.417
		134	0.249	134	0.00281	575	0.423
		136	0.259	136	0.00292	600	0.428
		138	0.270	138	0.00303		

# PHENYLMERCURIC ACETATE

PMA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetato-phenylmercury (Acetato-o) phenyl mercury Cocure 26 Cosan PMA-100	Solid  Lustrous white  Slightly vinegary  Floats on and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID OR DUST.</b> Wear self-contained breathing apparatus and protective clothing. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Emits toxic fumes under fire conditions. Wear self-contained breathing apparatus and protective clothing. Extinguish fires with water spray, CO <sub>2</sub> , dry chemical, or foam.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID</b> DUST POISONOUS IF INHALED OR SKIN IS EXPOSED Will blister skin upon prolonged contact. IF IN EYES: hold eyelids open, flush with running water for at least 15 minutes. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>SOLID</b> POISONOUS IN SWALLOWED OR ABSORBED THROUGH THE SKIN Will blister skin upon prolonged contact. IF IN EYES: hold eyelids open, flush with running water for at least 15 minutes. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.
<b>Water Pollution</b>	Harmful to aquatic life. Fouling to shoreline. Dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Contain  
Collection Systems: Skim  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** CH<sub>3</sub>COOHgC<sub>6</sub>H<sub>5</sub>  
2.3 **IMO/UN Designation:** 6.1/1674  
2.4 **DOT ID No.:** 1674  
2.5 **CAS Registry No.:** 62-38-4  
2.6 **NAERG Guide No.:** 151  
2.7 **Standard Industrial Trade Classification:** 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Mercury vapor face mask or approved respirator, safety goggles, rubber gloves, other protective clothing.
- 3.2 **Symptoms Following Exposure:** Extremely destructive to the eyes, nose, throat, upper respiratory tract, and skin. Causes blistering of skin upon prolonged contact. Inhalation may be fatal as a result of spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Prolonged exposure may result in heavy metal poisoning.
- 3.3 **Treatment of Exposure:** Call a physician. EYES: Hold eyelids open, flush with running water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes, flush affected areas with water for at least 15 minutes. INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: If victim is conscious, have victim drink water or milk and have victim induce vomiting. If victim is unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> = 13 mg/kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Carcinogen.  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 140°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** CO<sub>2</sub>, dry chemical, foam, water fog  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Toxic fumes of Hg  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** P092  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 336.7  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** 300°F = 149°C = 422°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.24 (est)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PHENYLMERCURIC ACETATE

PMA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# PROPYLENE GLYCOL METHYL ETHER

PME

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dowanol 33B Dowanol PM 1-Methoxy-2-propanol	Liquid	Colorless	Mild odor
Mixes with water. Irritating vapor is produced.			
Call fire department. Avoid contact with vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. Move to fresh air.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{OCH}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 3092  
2.5 CAS Registry No.: 107-98-2  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety goggles, protective clothing.  
3.2 **Symptoms Following Exposure:** Liquid irritates eyes and skin.  
3.3 **Treatment of Exposure:** EYES: wash with water for 15 min.; call a physician. SKIN: remove contaminated clothing and wash skin with water.  
3.4 **TLV-TWA:** 100 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 150 ppm  
3.7 **Toxicity by Ingestion:** Grade 1;  $\text{LD}_{50}$  = 5 to 15 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation, such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 90°F O.C.  
4.2 **Flammable Limits in Air:** 1.6 - 13.8%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 90.12  
9.3 **Boiling Point at 1 atm:** 250°F = 121°C = 394°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** 537.8°F = 281°C = 554.2°K  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.924 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.066  
9.12 **Latent Heat of Vaporization:** (est.) 166 Btu/lb = 92.3 cal/g = 3.86 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -13,600 Btu/lb = -7580 cal/g = -317 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PROPYLENE GLYCOL METHYL ETHER

PME

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
55	58.240	C U R R E N T L Y  N O T  A V A I L A B L E			N O T  P E R T I N E N T		N O T  P E R T I N E N T
60	58.050						
65	57.860						
70	57.670						
75	57.470						
80	57.280						
85	57.090						
90	56.900						
95	56.710						
100	56.520						
105	56.330						
110	56.140						
115	55.950						
120	55.760						
125	55.570						
130	55.380						
135	55.190						
140	54.990						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		70	0.161	70	0.00255	0	0.324
		80	0.230	80	0.00358	25	0.336
		90	0.324	90	0.00494	50	0.347
		100	0.448	100	0.00672	75	0.358
		110	0.610	110	0.00899	100	0.369
		120	0.820	120	0.01188	125	0.379
		130	1.088	130	0.01549	150	0.390
		140	1.425	140	0.01996	175	0.400
		150	1.847	150	0.02543	200	0.410
		160	2.367	160	0.03207	225	0.420
		170	3.003	170	0.04004	250	0.430
		180	3.773	180	0.04952	275	0.440
		190	4.700	190	0.06073	300	0.449
		200	5.804	200	0.07386	325	0.458
		210	7.111	210	0.08914	350	0.468
		220	8.647	220	0.10680	375	0.477
		230	10.440	230	0.12710	400	0.485
		240	12.520	240	0.15020	425	0.494
		250	14.920	250	0.17650	450	0.503
		260	17.680	260	0.20620	475	0.511
		270	20.820	270	0.23950	500	0.519
		280	24.390	280	0.27680	525	0.527
		290	28.420	290	0.31820	550	0.535
		300	32.950	300	0.36420	575	0.543
		310	38.030	310	0.41480	600	0.551
		320	43.700	320	0.47050		

# N-PROPYL MERCAPTAN

PMN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Propane-1-thiol 1-Propanethiol	Liquid  Colorless  Skunk-like odor  Floats on water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. Avoid contact with vapor. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Do not burn  
Clean shore line

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}_2\text{SH}$   
2.3 IMO/UN Designation: 3.1/2704  
2.4 DOT ID No.: 2402  
2.5 CAS Registry No.: 107-03-9  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51549

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves; self-contained breathing apparatus or organic canister mask
- 3.2 **Symptoms Following Exposure:** Inhalation causes muscular weakness, convulsions, and respiratory paralysis; high concentrations may cause pulmonary irritation. Contact with liquid causes irritation of eyes and skin. Ingestion causes irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from contaminated atmosphere; give artificial respiration and oxygen if needed; observe for premonitory signs of pulmonary edema. EYES: flush with water for 15 min.; if irritation persists, see a physician. SKIN: flush with water; wash with soap and water. INGESTION: induce vomiting and follow with gastric lavage.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 1,790 \text{ mg/kg}$  (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** 0.00075 ppm  
3.13 **IDLH Value:** Currently not available  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 5°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Toxic sulfur dioxide is generated.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 5.1 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Cautics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 76.2  
9.3 **Boiling Point at 1 atm:** 153°F = 67°C = 340°K  
9.4 **Freezing Point:** -171°F = -113°C = 160°K  
9.5 **Critical Temperature:** (est.) 495°F = 257°C = 530°K  
9.6 **Critical Pressure:** (est.) 667 psia = 45.3 atm = 4.60 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.841 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 24.7 dynes/cm = 0.0247 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 18 dynes/cm = 0.018 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 2.6  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0984  
9.12 **Latent Heat of Vaporization:** 179 Btu/lb = 99 cal/g = 4.16 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -15,990 Btu/lb = -8,890 cal/g = 372 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# N-PROPYL MERCAPTAN

PMN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	53.090	52	0.446	52	1.048	46	0.459
36	53.050	54	0.447	54	1.048	48	0.453
38	53.020	56	0.448	56	1.048	50	0.447
40	52.980	58	0.449	58	1.048	52	0.441
42	52.950	60	0.451	60	1.048	54	0.435
44	52.910	62	0.452	62	1.048	56	0.430
46	52.880	64	0.453	64	1.048	58	0.424
48	52.840	66	0.454	66	1.048	60	0.419
50	52.810	68	0.455	68	1.048	62	0.414
52	52.770	70	0.456	70	1.048	64	0.409
54	52.740	72	0.457	72	1.048	66	0.404
56	52.710	74	0.458	74	1.048	68	0.399
58	52.670	76	0.459	76	1.048	70	0.394
60	52.640	78	0.461	78	1.048	72	0.389
62	52.600	80	0.462	80	1.048	74	0.385
64	52.570	82	0.463	82	1.048	76	0.380
66	52.530	84	0.464	84	1.048	78	0.376
68	52.500	86	0.465	86	1.048	80	0.372
70	52.460					82	0.367
72	52.430					84	0.363
74	52.390					86	0.359
76	52.360					88	0.355
78	52.320						
80	52.290						
82	52.250						
84	52.220						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	35	1.050	35	0.01507	0	0.291
	N	40	1.205	40	0.01712	10	0.291
	S	45	1.379	45	0.01939	20	0.291
	O	50	1.573	50	0.02191	30	0.291
	L	55	1.791	55	0.02470	40	0.291
	U	60	2.033	60	0.02777	50	0.291
	B	65	2.303	65	0.03116	60	0.291
	L	70	2.602	70	0.03487	70	0.291
	E	75	2.934	75	0.03895	80	0.291
		80	3.300	80	0.04341	90	0.291
		85	3.704	85	0.04828	100	0.291
		90	4.149	90	0.05358	110	0.291
		95	4.638	95	0.05936	120	0.291
		100	5.174	100	0.06563	130	0.291
		105	5.761	105	0.07242	140	0.291
		110	6.402	110	0.07978	150	0.291
		115	7.102	115	0.08773	160	0.291
		120	7.864	120	0.09630	170	0.291
		125	8.693	125	0.10550	180	0.291
		130	9.593	130	0.11550	190	0.291
		135	10.570	135	0.12620	200	0.291
		140	11.620	140	0.13760	210	0.291
		145	12.760	145	0.14990	220	0.291
		150	14.000	150	0.16300	230	0.291
		155	15.320	155	0.17700	240	0.291
						250	0.291

# PROPIONIC ACID

PNA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethanecarboxylic acid Methylacetic acid Propanoic acid	Liquid  Colorless  Sharp rancid odor  Mixes with water. Irritating vapor is produced.
Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move to fresh air.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 4; Organic acid
- 2.2 Formula:  $\text{CH}_3\text{CH}_2\text{COOH}$
- 2.3 IMO/UN Designation: 8.0/1848
- 2.4 DOT ID No.: 1848
- 2.5 CAS Registry No.: 79-09-4
- 2.6 NAERG Guide No.: 132
- 2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask for high vapor concentrations; plastic gloves; goggles or face shield.
- 3.2 **Symptoms Following Exposure:** Liquid causes skin and eye burns. Vapors may irritate eyes, nose, and throat, but should not cause systemic illness.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. INGESTION: have victim drink water or milk; do NOT induce vomiting. SKIN OR EYE CONTACT: immediately flush with plenty of water for at least 15 min.; get medical care for eyes; remove contaminated clothing.
- 3.4 TLV-TWA: 10 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral rat  $\text{LD}_{50}$  = 2.6 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 134°F O.C. 126°F C.C.
- 4.2 **Flammable Limits in Air:** 2.9% (calc.)-12.1%
- 4.3 **Fire Extinguishing Agents:** Water, carbon dioxide, dry chemical, or alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 870°F
- 4.8 **Electrical Hazards:** I, D
- 4.9 **Burning Rate:** 2.2 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 16.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Corrodes ordinary steel and many other metals, but reaction is not hazardous.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water, then neutralize with lime or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** >1000 mg/l/48 hr/culex sp. larvae/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 78%, 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 1
  - Human Oral hazard: 1
  - Human Contact hazard: II
  - Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 74.08
- 9.3 **Boiling Point at 1 atm:** 285.4°F = 140.8°C = 414.0°K
- 9.4 **Freezing Point:** -5.3°F = -20.7°C = 252.5°K
- 9.5 **Critical Temperature:** 642.2°F = 339°C = 612.2°K
- 9.6 **Critical Pressure:** 779 psia = 53 atm = 5.37 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.995 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 26.2 dynes/cm = 0.0262 N/m at 25°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.103
- 9.12 **Latent Heat of Vaporization:** 248 Btu/lb = 138 cal/g = 5.78 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -8,883 Btu/lb = -4,935 cal/g = 206.6 X 10<sup>6</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.2 psia

### NOTES

# PROPIONIC ACID

PNA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	63.560	0	0.533		N		N
40	63.370	10	0.537		O		O
45	63.170	20	0.540		T		T
50	62.980	30	0.544				
55	62.790	40	0.548		P		P
60	62.600	50	0.552		E		E
65	62.410	60	0.556		R		R
70	62.220	70	0.559		T		T
75	62.030	80	0.563		I		I
80	61.840	90	0.567		N		N
85	61.650	100	0.571		E		E
90	61.460	110	0.574		N		N
95	61.270	120	0.578		T		T
100	61.080	130	0.582				
105	60.890	140	0.586				
110	60.700	150	0.590				
115	60.500	160	0.593				
120	60.310	170	0.597				
125	60.120	180	0.601				
130	59.930	190	0.605				
135	59.740	200	0.608				
140	59.550	210	0.612				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	40	0.021	40	0.00029	0	0.254
	I	50	0.031	50	0.00042	25	0.267
	S	60	0.045	60	0.00060	50	0.279
	C	70	0.065	70	0.00085	75	0.290
	I	80	0.092	80	0.00118	100	0.302
	B	90	0.129	90	0.00162	125	0.313
	L	100	0.178	100	0.00220	150	0.323
	E	110	0.244	110	0.00296	175	0.333
		120	0.330	120	0.00393	200	0.343
		130	0.442	130	0.00517	225	0.352
		140	0.586	140	0.00675	250	0.361
		150	0.771	150	0.00872	275	0.370
		160	1.004	160	0.01118	300	0.378
		170	1.297	170	0.01421	325	0.386
		180	1.661	180	0.01792	350	0.393
		190	2.113	190	0.02244	375	0.400
		200	2.667	200	0.02790	400	0.407
		210	3.344	210	0.03446	425	0.413
		220	4.164	220	0.04228	450	0.419
		230	5.153	230	0.05156	475	0.425
		240	6.337	240	0.06251	500	0.430
		250	7.749	250	0.07536	525	0.434
		260	9.423	260	0.09036	550	0.439
		270	11.400	270	0.10780	575	0.443
		280	13.710	280	0.12790	600	0.446

# 2-PENTANONE

PNE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethyl acetone Methyl n-propyl ketone	Liquid  Colorless  Powerful ethereal, fruity odor.  Floats on water.
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Flammable. Vapors can flow to distant ignition source and flash back. Containers may rupture when overheated. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{C}(\text{O})\text{CH}_2\text{CH}_2\text{CH}_3$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: 1249  
2.5 CAS Registry No.: 107-87-9  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51625

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat. May cause dizziness, headache, drowsiness, narcosis, and unconsciousness. Skin contact can cause irritation.
- 3.3 **Treatment of Exposure:** Get medical attention. **INHALATION:** Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. **EYES:** Flush with water for at least 15 min., lifting lids occasionally. Contact lenses should not be worn when working with this chemical. **SKIN:** Remove contaminated clothing and shoes. Wash with soap and water.
- 3.4 TLV-TWA: 200 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 250 ppm.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat  $\text{LD}_{50}$  = 3.73 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Dermal exposure can cause dermatitis.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 11 ppm.  
3.13 **IDLH Value:** 1,500 ppm.  
3.14 OSHA PEL-TWA: 200 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 45°F C.C.  
4.2 **Flammable Limits in Air:** LEL: 1.6%; UEL: 8.2%  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Use water with caution. Since the material is lighter than water and only moderately soluble, the fire could easily be spread by use of water in uncontained area.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Vapors can flow along surfaces to distant ignition source and flash back.  
4.7 **Auto Ignition Temperature:** 846°F.  
4.8 **Electrical Hazards:** May dissolve some plastics, resins and rubber (insulators).  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Reaction with oxidizing agents may cause fires and explosions.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97%; 90%; technical.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 86.15  
9.3 Boiling Point at 1 atm: 216°F = 102.3°C = 375.3°K  
9.4 Freezing Point: -108°F = -77.5°C = 195.5°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 0.81 @ 20°C  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 2.97  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent.  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# 2-PENTANONE

PNE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	6.760		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	5.950	68	0.538	68	0.00817		C U R R E N T L Y  N O T  A V A I L A B L E



# N-PROPYL NITRATE

PNI

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid Colorless to pale yellow Ether-like odor
Wear full chemical protective clothing, gloves, goggles and approved respirator. Evacuate. Shut off ignition sources and call the fire department. Notify local health and pollution control agencies. Protect water intakes.	
Fire	Flammable. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with alcohol foam, dry chemical, or CO <sub>2</sub> .
Exposure	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, give two glasses of water and induce vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>NO<sub>3</sub>  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: 1865  
2.5 CAS Registry No.: 627-13-4  
2.6 NAERG Guide No.: 131  
2.7 Standard Industrial Trade Classification: 51140

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full, impervious chemical protective clothing and gloves, goggles, and approved respirator.  
3.2 **Symptoms Following Exposure:** Exposure can cause anoxia and cyanosis. Other effects are weakness, dizziness, and severe headaches.  
3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. Contact lenses should not be worn when working with this chemical. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. INGESTION: Give two glasses of water and induce vomiting.  
3.4 **TLV-TWA:** 25 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 40 ppm  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 50 ppm.  
3.13 **IDLH Value:** 500 ppm  
3.14 **OSHA PEL-TWA:** 25 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 68°F C.C.  
4.2 **Flammable Limits in Air:** LEL: 2%; UEL: 100%  
4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Toxic gases and vapors, such as oxides of nitrogen and carbon monoxide, may be released in a fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 347°F.  
4.8 **Electrical Hazards:** I, B  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 20.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Contact with either strong oxidizers or with combustibles may cause fires and explosions.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable Liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	3
Special (White).....	OX

  
8.6 **EPA Reportable Quantity:** Not listed  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid.  
9.2 **Molecular Weight:** 105.1  
9.3 **Boiling Point at 1 atm:** 231°F = 111°C = 384°K  
9.4 **Freezing Point:** <-150°F = <-101°C = <172°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.06  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 3.6  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N-PROPYL NITRATE

PNI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	68	0.348	68	0.00646		C U R R E N T L Y  N O T  A V A I L A B L E

# POTASSIUM NITRATE

PNR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dexol stump remover Potash nitrate Saltpeter	Solid, crystal or powder  White  Odorless   Very soluble.
Wear full cover clothing, chemical safety glasses, and approved dust respirator. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Nonflammable. Wear full protective clothing with self-contained breathing apparatus. Flood with large quantities of water. Strong oxidizer which may react spontaneously with low flash point organics or reducing agents. Increases flammability of combustible materials.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Move victim to fresh air.  SOLID Mildly irritating to skin, eyes and mucous membranes. Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: KNO<sub>3</sub>  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: 1486  
2.5 CAS Registry No.: 7757-79-1  
2.6 NAERG Guide No.: 140  
2.7 Standard Industrial Trade Classification: 52352

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full cover clothing and chemical goggles. Use approved respirator to protect against dust.  
3.2 **Symptoms Following Exposure:** Exposure can cause mild irritation of eyes, nose and throat.  
3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rabbit LD<sub>50</sub> = 1.66 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available.  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable.  
4.2 **Flammable Limits in Air:** Not pertinent.  
4.3 **Fire Extinguishing Agents:** Flood with large quantity of water.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.  
4.5 **Special Hazards of Combustion Products:** May produce toxic nitrogen oxides upon decomposition.  
4.6 **Behavior in Fire:** Strong oxidizer which may react explosively when mixed with reducing agents. Mixture may detonate by heat or shock. Increases the flammability of any combustible material.  
4.7 **Auto Ignition Temperature:** Not pertinent.  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Not pertinent.  
4.10 **Adiabatic Flame Temperature:** Not pertinent.  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Not pertinent.  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Incompatible with reducing agents, combustible materials, and heat. Can be explosive when mixed with reducing agents.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.99%; CP; technical.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer  
8.2 **49 CFR Class:** 5.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 101.11  
9.3 **Boiling Point at 1 atm:** 752°F = 400°C = 673°K (decomposes)  
9.4 **Freezing Point:** 633.2°F = 334°C = 607°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 2.109  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# POTASSIUM NITRATE

PNR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
32 212	13.300 246.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# POTASSIUM ARSENITE

POA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arsenious acid, potassium salt Fowlers solution Potassium metaarsenite	Solid  White  Odorless  Mixes with water.
Keep people away. AVOID CONTACT WITH SOLID. Wear goggles, self-contained breathing apparatus, rubberoverclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID POISONOUS IF SWALLOWED. Irritating to skin, eyes, and nose. Move to fresh air. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and the victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $KAsO_2$ ;  $HAsO_2$   
2.3 IMO/UN Designation: 6.1/1678  
2.4 DOT ID No.: 1678  
2.5 CAS Registry No.: 10124-50-2  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 52389

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective clothing, hand and arm protection, waterproof boots, respirator, and eye protection.
- 3.2 **Symptoms Following Exposure:** INHALATION: Irritation of nasal mucosa, laryngitis, and bronchitis. Heavier exposure may produce perforation of cartilaginous nasal septum. EYES: Conjunctivitis. SKIN: Irritation, skin lesions. INGESTION: Dryness, irritation of mouth and difficulty in swallowing. Followed by vomiting, abdominal pain, and diarrhea. Pain in limbs, headache, convulsions, muscular weakness, and unconsciousness.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove to clean area. EYES: Flush with water. SKIN: Remove contaminated clothing under a shower. Flush exposed skin thoroughly with water. INGESTION: Induce vomiting, gastric lavage, and catharsis. Prompt administration of BAL.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 4;  $LD_{50} = 14$  mg/kg.  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 **Chronic Toxicity:** Chronic arsenic intoxication by ingestion may cause weakness, loss of appetite, gastrointestinal disturbances, peripheral neuritis, nepatitis, and skin disorders such as keratitis and pigmentation. Can cause skin cancer. Other cancers, notably lung and liver have been reported.
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Currently not available  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Hygroscopic, gradually decomposes on exposure to air (by  $CO_2$ ).  
5.4 Neutralizing Agents for Acids and Caustics: Currently not available  
5.5 Polymerization: Currently not available  
5.6 Inhibitor of Polymerization: Currently not available

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Fish toxicity, critical concentration 2 mg/l.  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 3  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0

8.6 EPA Reportable Quantity: 1 pound.  
8.7 EPA Pollution Category: X  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 253.93  
9.3 Boiling Point at 1 atm: Currently not available  
9.4 Freezing Point: Currently not available  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: Currently not available  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 8.76 (calculated)  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# POTASSIUM ARSENITE

POA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# PENTANOIC ACID

POC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Valeric acid		Liquid	Colorless	Unpleasant
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, or carbon dioxide.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Corrosive to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CH}_3(\text{CH}_2)_4\text{COOH}$
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: 1760
- 2.5 CAS Registry No.: 109-52-4
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Do not wear contact lenses when working with this material. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Corrosive. Very destructive to tissues of the mucous membranes, upper respiratory tract, eyes, and skin. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, nausea and vomiting. Extremely destructive to skin. May be absorbed through the skin.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 3; oral rat  $\text{LD}_{50}$  = 200 mg/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 205°F C.C.
- 4.2 Flammable Limits in Air: 1.6%-7.6%
- 4.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, or carbon dioxide.
- 4.4 Fire Extinguishing Agents Not to Be Used: Water.
- 4.5 Special Hazards of Combustion Products: Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: 752°F
- 4.8 Electrical Hazards: Not listed.
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 30.9 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 10.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99%; technical.
- 7.2 Storage Temperature: Ambient.
- 7.3 Inert Atmosphere: No requirement.
- 7.4 Venting: Not listed.
- 7.5 IMO Pollution Category: D
- 7.6 Ship Type: Data not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material
- 8.2 49 CFR Class: 8
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: May generate heat.
- 5.2 Reactivity with Common Materials: Incompatible with strong oxidizers.
- 5.3 Stability During Transport: Stable.
- 5.4 Neutralizing Agents for Acids and Caustics: Lime.
- 5.5 Polymerization: Will not polymerize.
- 5.6 Inhibitor of Polymerization: Not pertinent.

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 102.13
- 9.3 Boiling Point at 1 atm: 365°F = 185°C = 458°K
- 9.4 Freezing Point: 0°F = -18°C = 255°K
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 0.939
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Currently not available
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent.
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 1
  - Human Oral hazard: 1
  - Human Contact hazard: II
  - Reduction of amenities: XX

### NOTES

# PENTANOIC ACID

POC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E	68	0.003	68	0.00005		C U R R E N T L Y  N O T  A V A I L A B L E



# POTASSIUM OLEATE

POE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Potash soap		Liquid	Clear to hazy amber	Soap-like
Wear full cover clothing, chemical safety glasses, and rubber or plastic gloves. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Nonflammable. Wear full protective clothing with self-contained breathing apparatus. Extinguish adjacent fire with water spray, carbon dioxide, alcohol foam, or dry chemical. Cool exposed containers with water spray.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air.  LIQUID Irritating to skin, eyes and mucous membranes. Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is conscious, give large amounts of water followed by milk. Do not induce vomiting.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOK}$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 61790-24-7 (18% solution in water)  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51378

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear full cover clothing, chemical safety glasses, and rubber or plastic gloves.  
3.2 **Symptoms Following Exposure:** Exposure can cause mild irritation of eyes, nose and throat. May burn on prolonged contact. May cause irritation of gastrointestinal tract, nausea and vomiting if ingested.  
3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. INGESTION: Do not induce vomiting. Give victim large amounts of water followed by milk if available.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable.  
4.2 **Flammable Limits in Air:** Not pertinent.  
4.3 **Fire Extinguishing Agents:** Fight adjacent fire with water spray, carbon dioxide, alcohol foam or dry chemical.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Not pertinent.  
4.7 **Auto Ignition Temperature:** Not pertinent.  
4.8 **Electrical Hazards:** Not pertinent.  
4.9 **Burning Rate:** Not pertinent.  
4.10 **Adiabatic Flame Temperature:** Not pertinent.  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Not pertinent.  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Incompatible with strong oxidizing agents, strong acids and metallic salts.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: -  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 40% paste; 18% solution in water.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 320.57  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.0  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# POTASSIUM OLEATE

POE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	7.900		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# POTASSIUM PEROXIDE

POP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Potassium superoxide	Solid (powder)      Yellow      Odorless  Sinks and mixes violently with water.
Evacuate. Keep people away. Avoid contact with solid and dust. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. May cause fire on contact with combustibles. Combat fires from safe distance or protected location. Floor discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $K_2O_2$   
2.3 IMO/UN Designation: 5.1/1491  
2.4 DOT ID No.: 1491  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 144  
2.7 Standard Industrial Trade Classification: 52264

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves  
3.2 **Symptoms Following Exposure:** Inhalation causes respiratory irritation. Ingestion causes severe burns of mouth and stomach. Contact with eyes or skin causes irritation and caustic burns.  
3.3 **Treatment of Exposure:** INHALATION: remove from exposure; support respiration. INGESTION: give large amount of water; do NOT induce vomiting; get medical attention. EYES: irrigate with large quantities of water for at least 15 min.; get medical attention for caustic burns. SKIN: flush with water; treat caustic burns.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Flood with water from a protected area.  
4.4 **Fire Extinguishing Agents Not to Be Used:** A small amount of water may cause explosions.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Increases intensity of fire and can start fires when in contact with organic combustibles  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently with liberation of heat and oxygen and the formation of caustic solution  
5.2 **Reactivity with Common Materials:** Can form explosive and self-igniting mixtures with wood or other combustible materials  
5.3 **Stability During Transport:** Stable if kept dry  
5.4 **Neutralizing Agents for Acids and Caustics:** Following reaction with water, caustic formed can be flushed away with water and area rinsed with dilute acetic acid.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 80 ppm/24 hr/mosquitofish/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; Pure  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer  
8.2 49 CFR Class: 5.1  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	2
Special (White).....	OX

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 110  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: 914°F = 490°C = 763°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: >1 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 55.3 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# POTASSIUM PEROXIDE

POP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# PROPYLENE OXIDE

POX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Epoxypropane Methyloxirane Propyleneoxide	Liquid  Colorless  Sweet, alcohol odor  Mixes with water. Flammable, irritating vapor is produced.
Evacuate. Keep people away. <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from safe distance or protected location. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause headache, nausea, vomiting, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 16; Alkylene oxide  
2.2 Formula:  $\text{CH}_3\text{CHCH}_2\text{O}$   
2.3 IMO/UN Designation: 3.1/1280  
2.4 DOT ID No.: 1280  
2.5 CAS Registry No.: 75-56-9  
2.6 NAERG Guide No.: 127P  
2.7 Standard Industrial Trade Classification: 51614

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask; rubber or plastic gloves; vapor-proof goggles.  
3.2 **Symptoms Following Exposure:** Inhalation may produce headache, nausea, vomiting, and unconsciousness; mild depression of central nervous system; lung irritation. Slightly irritating to skin, but covered contact may cause burn. Very irritating to eyes.  
3.3 **Treatment of Exposure:** INHALATION: remove person to fresh air immediately, keep quiet and warm; call a physician; if breathing stops, start artificial respiration. SKIN OR EYE CONTACT: immediately flush with plenty of water for at least 15 min.; immediately remove contaminated clothing, watch bands, rings, etc. to prevent confining product to skin; for eyes get medical attention.  
3.4 **TLV-TWA:** 20 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** 200 ppm  
3.13 **IDLH Value:** 400 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  $-35^\circ\text{F C.C.}; <-20^\circ\text{F O.C.}$   
4.2 **Flammable Limits in Air:** 2.1%-38.5%  
4.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; alcohol or polymer foam for large fires.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Containers may explode. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:**  $869^\circ\text{F}$   
4.8 **Electrical Hazards:** Class I, Group B (C)  
4.9 **Burning Rate:** 3.3 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 19.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):**  $\text{N}_2$  diluent: 7.8%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** May occur due to high temperatures, contamination with alkalies, aqueous acids, amines, and acidic alcohols.  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.99% (must contain no acetylene)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Inerted  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	4
Instability (Yellow).....	2

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at  $15^\circ\text{C}$  and 1 atm:** Liquid  
9.2 **Molecular Weight:** 58.08  
9.3 **Boiling Point at 1 atm:**  $93.7^\circ\text{F} = 34.3^\circ\text{C} = 307.5^\circ\text{K}$   
9.4 **Freezing Point:**  $-169.4^\circ\text{F} = -111.9^\circ\text{C} = 161.3^\circ\text{K}$   
9.5 **Critical Temperature:**  $408.4^\circ\text{F} = 209.1^\circ\text{C} = 482.3^\circ\text{K}$   
9.6 **Critical Pressure:** 714 psia = 48.6 atm = 4.92 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.830 at  $20^\circ\text{C}$  (liquid)  
9.8 **Liquid Surface Tension:** 24.5 dynes/cm = 0.0245 N/m at  $15^\circ\text{C}$   
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.0  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.133  
9.12 **Latent Heat of Vaporization:** 205 Btu/lb = 114 cal/g =  $4.77 \times 10^5$  J/kg  $4.77 \times 10^5$  J/kg  
9.13 **Heat of Combustion:**  $-13,000$  Btu/lb =  $-7,221$  cal/g =  $-302.3 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.)  $-19$  Btu/lb =  $-11$  cal/g =  $-0.45 \times 10^5$  J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 18.0 psia

### NOTES

# PROPYLENE OXIDE

POX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-35	56.390	0	0.433		N		N
-30	56.170	10	0.445		O		O
-25	55.940	20	0.457		T		T
-20	55.720	30	0.469				
-15	55.490	40	0.482		P		P
-10	55.270	50	0.494		E		E
-5	55.040	60	0.506		R		R
0	54.810	70	0.518		T		T
5	54.591	80	0.531		I		I
10	54.360	90	0.543		N		N
15	54.140				E		E
20	53.910				N		N
25	53.690				T		T
30	53.460						
35	53.240						
40	53.010						
45	52.791						
50	52.560						
55	52.330						
60	52.110						
65	51.880						
70	51.660						
75	51.430						
80	51.210						
85	50.980						
90	50.760						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	40.500	-50	0.207	-50	0.00274	0	0.257
		-40	0.318	-40	0.00410	25	0.270
		-30	0.474	-30	0.00598	50	0.283
		-20	0.691	-20	0.00850	75	0.296
		-10	0.983	-10	0.01183	100	0.308
		0	1.371	0	0.01613	125	0.320
		10	1.875	10	0.02160	150	0.332
		20	2.521	20	0.02844	175	0.344
		30	3.337	30	0.03687	200	0.355
		40	4.353	40	0.04713	225	0.366
		50	5.601	50	0.05946	250	0.377
		60	7.118	60	0.07411	275	0.388
		70	8.941	70	0.09133	300	0.398
		80	11.110	80	0.11140	325	0.409
		90	13.670	90	0.13450	350	0.419
		100	16.660	100	0.16100	375	0.429
		110	20.130	110	0.19110	400	0.438
		120	24.120	120	0.22510	425	0.448
		130	28.680	130	0.26320	450	0.457
		140	33.860	140	0.30550	475	0.466
		150	39.710	150	0.35240	500	0.475
						525	0.484
						550	0.492
						575	0.501
						600	0.509

# POLYPHOSPHORIC ACID

PPA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Condensed phosphoric acid	Liquid	Colorless	Odorless
Sinks and mixes with water.			
Keep people away. AVOID CONTACT WITH LIQUID. Wear chemical protective suit with self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. Flammable gas may be produced on contact with metal. Wear chemical protective suit with self-contained breathing apparatus.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $(P_2O_5)(H_2O)_{3-3}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52234

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves or protective clothing.
- 3.2 Symptoms Following Exposure: Liquid burns skin and eyes unless washed off quickly. If ingested will burn mouth and stomach unless diluted at once.
- 3.3 Treatment of Exposure: INGESTION: give victim water, milk, or vegetable oil; do NOT induce vomiting. SKIN OR EYES: flush with water for at least 15 min.; call doctor for eye exposure.
- 3.4 TLV-TWA: Currently not available
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: None
- 3.10 Vapor (Gas) Irritant Characteristics: Non-volatile
- 3.11 Liquid or Solid Characteristics: Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact.
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not flammable
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not flammable
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts with water to generate heat and form phosphoric acid. The reaction is not violent.
- 5.2 Reactivity with Common Materials: Reacts with metals to liberate flammable hydrogen gas.
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Flush with water, neutralize acid with lime or soda ash.
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 138 ppm/24 hr/mosquito fish/TL<sub>m</sub>/fresh water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 115% phosphoric acid
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open or pressure-vacuum
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: Not pertinent
- 9.3 Boiling Point at 1 atm: 1022°F = 550°C = 823°K
- 9.4 Freezing Point: 100°F = 38°C = 311°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.05 at 38°C (liquid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# POLYPHOSPHORIC ACID

PPA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
100	127.099	110	0.299		N O T		N O T
110	126.799	120	0.303				
120	126.500	130	0.307				
130	126.200	140	0.311				
140	125.799	150	0.315		P		P
150	125.500	160	0.319		E		E
160	125.200	170	0.323		R		R
170	124.900	180	0.326		T		T
180	124.599	190	0.330		I		I
190	124.299	200	0.334		N		N
200	124.000	210	0.338		E		E
210	123.700	220	0.342		N		N
		230	0.346		T		
		240	0.350				
		250	0.354				
		260	0.358				
		270	0.361				
		280	0.365				
		290	0.369				
		300	0.373				
		310	0.377				
		320	0.381				
		330	0.385				
		340	0.389				
		350	0.393				
		360	0.396				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	150	0.000		N		N
	I	200	0.000		O		O
	S	250	0.000		T		T
	C	300	0.000				
	I	350	0.000		P		P
	B	400	0.001		E		E
	L	450	0.002		R		R
	E	500	0.008		T		T
		550	0.023		I		I
		600	0.060		N		N
		650	0.143		E		E
		700	0.317		N		N
		750	0.658		T		T
		800	1.288				
		850	2.396				
		900	4.258				



# PHOSPHORUS, BLACK

PPB

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid Black

Sinks in water.

Notify local health and pollution control agencies.

### Fire

Combustible

### Exposure

Exposure data not available.

### Water Pollution

Effects of low concentrations on aquatic life are unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 0; Unassigned cargoes  
2.2 Formula: P  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 7723-14-0  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 52222

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Currently not available  
3.2 Symptoms Following Exposure: Currently not available  
3.3 Treatment of Exposure: Currently not available  
3.4 TLV-TWA: 0.02 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 5 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 0.1 mg/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Currently not available  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Currently not available  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: >752  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 5.9 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 0.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Currently not available  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Solid in air  
5.4 Neutralizing Agents for Acids and Caustics: Currently not available  
5.5 Polymerization: Currently not available  
5.6 Inhibitor of Polymerization: Currently not available

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available  
7.2 Storage Temperature: Currently not available  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 1 pound  
8.7 EPA Pollution Category: X  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 30.975  
9.3 Boiling Point at 1 atm: 838.9°F = 448.3°C = 721.4°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 2.691 at 20°C  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 4.27 (Vapor molecule is P<sub>4</sub>)  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: -9815 Btu/lb = -5453 cal/g = -228.2 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

PHOSPHORUS, BLACK

PPB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT PERTINENT		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	INSOLUBLE		VERY LOW		NOT PERTINENT	-100 -80 -60 -40 -20 0 20 40 60 80 100 120 140 160 180 200 220 240 260	0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040 0.040

# PROPANEDINITRILE

PPD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cyanoacetoneitrile Diethyanoethane Malonic dinitrile Malononitrile Methylene cyanide	Solid, crystals or powder  Colorless, white  Sinks and mixes with water. Melting point is 90-93°F.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE. POISONOUS GASES ARE PRODUCED IN FIRE OR WHEN HEATED. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemicals, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Combat fires from safe distance or protected location. Move container from fire area if you can do it without risk.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR ABSORBED THROUGH SKIN. Irritating to eyes. IF IN EYES OR ON SKIN, flush with running water for at least 15 min., hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: CH <sub>2</sub> (CN) <sub>2</sub> 2.3 IMO/UN Designation: 6.1/2647 2.4 DOT ID No.: 2647 2.5 CAS Registry No.: 109-77-3 2.6 NAERG Guide No.: 153 2.7 Standard Industrial Trade Classification: 51484
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Poisonous if inhaled, swallowed or absorbed through the skin; an eye irritant. 3.3 <b>Treatment of Exposure:</b> Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Immediately flush with running water for at least 15 min., hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 4; LD <sub>50</sub> = 19 mg/kg (mouse) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 266°F.O.C; 234°F.C.C
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** They may contain toxic NO<sub>x</sub>, cyanide and cyanogen fumes.
- 4.6 **Behavior in Fire:** It burns to produce toxic and irritating gases.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable. Keep as cool as reasonably practical. May polymerize violently after prolonged heating at 130°C.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Violent polymerization may occur if held at 130°C. for an extended period of time.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.6 mg/l/96 hr/rainbow trout/LC<sub>50</sub>/fresh water  
1.3 to 1.6 mg/l/96 hr/kill fish/LC<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Not pertinent
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** U149
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 66.06
- 9.3 **Boiling Point at 1 atm:** 428°F. = 220°C. = 493°K.
- 9.4 **Freezing Point:** 90-93°F. = 32-34°C. = 305-307°K.
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.1910 at 20°C.
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 2.3 (est.)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# PROPANEDINITRILE

PPD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
93	65.500		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	13.000		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# N-PENTYL PROPIONATE

PPE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Amyl propionate	Liquid Colorless Apple-like odor  Floats on water.
Wear full impervious protective clothing and approved respirator. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Ester.  
2.2 Formula:  $\text{CH}_3\text{CH}_2\text{COO}(\text{CH}_2)_4\text{CH}_3$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 624-54-4  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 106°F O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, or carbon dioxide.  
4.4 Fire Extinguishing Agents Not to Be Used: Water.  
4.5 Special Hazards of Combustion Products: Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 712°F.  
4.8 Electrical Hazards: Not listed.  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 52.4 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 16.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.  
5.5 Polymerization: Will not polymerize.  
5.6 Inhibitor of Polymerization: Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical grades.  
7.2 Storage Temperature: Ambient.  
7.3 Inert Atmosphere: No requirement.  
7.4 Venting: Not listed.  
7.5 IMO Pollution Category: C  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.  
8.2 49 CFR Class: Not pertinent.  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 144.22  
9.3 Boiling Point at 1 atm: Currently not available  
9.4 Freezing Point: Currently not available  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 0.869 - 0.873 @ 20°C  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Currently not available  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent.  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# N-PENTYL PROPIONATE

PPE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	7.270		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# PROPYLENE GLYCOL

PPG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Dihydroxypropane Methylethylene glycol 1,2-Propanediol	Thick liquid  Colorless  Odorless  Mixes with water.
Keep people away. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	Not harmful.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{OH}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 57-55-6  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51229

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles.  
3.2 Symptoms Following Exposure: Liquid may irritate eyes.  
3.3 Treatment of Exposure: Flush eyes with plenty of water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (mouse)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat.  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 225°F O.C. 210°F C.C.  
4.2 Flammable Limits in Air: 2.6%-12.5%  
4.3 Fire Extinguishing Agents: Water fog, alcohol foam, carbon dioxide, dry chemical.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 700°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: 1.5 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 19.0 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 7.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: None  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 2.2% of theoretical in 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: USP, industrial, food (all 99+%)  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 76.10  
9.3 Boiling Point at 1 atm: 369.1°F = 187.3°C = 460.5°K  
9.4 Freezing Point: <-76°F = <-60°C = <213°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.04 at 20°C (liquid)  
9.8 Liquid Surface Tension: 36 dynes/cm = 0.036 N/m at 25°C  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.073  
9.12 Latent Heat of Vaporization: 306 Btu/lb = 170 cal/g = 7.12 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -10,310 Btu/lb = -5,728 cal/g = -239.8 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# PROPYLENE GLYCOL

PPG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	65.700	0	0.540		N		N
50	65.419	10	0.548		O		O
60	65.139	20	0.556		T		T
70	64.860	30	0.563				
80	64.589	40	0.571		P		P
90	64.309	50	0.579		E		E
100	64.030	60	0.587		R		R
110	63.750	70	0.594		T		T
120	63.480	80	0.602		I		I
130	63.200	90	0.610		N		N
140	62.920	100	0.618		E		E
150	62.640	110	0.626		N		N
160	62.370	120	0.633		T		T
170	62.090	130	0.641				
180	61.810	140	0.649				
190	61.530	150	0.657				
200	61.260	160	0.664				
210	60.980	170	0.672				
		180	0.680				
		190	0.688				
		200	0.696				
		210	0.703				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	80	0.002	80	0.00002	0	0.355
	I	100	0.005	100	0.00007	25	0.365
	S	120	0.014	120	0.00017	50	0.375
	C	140	0.033	140	0.00039	75	0.385
	I	160	0.074	160	0.00085	100	0.394
	B	180	0.153	180	0.00170	125	0.404
	L	200	0.297	200	0.00319	150	0.413
	E	220	0.544	220	0.00568	175	0.422
		240	0.950	240	0.00963	200	0.431
		260	1.589	260	0.01565	225	0.440
		280	2.557	280	0.02450	250	0.448
		300	3.975	300	0.03710	275	0.457
		320	5.995	320	0.05451	300	0.465
		340	8.795	340	0.07797	325	0.473
		360	12.590	360	0.10880	350	0.481
		380	17.610	380	0.14870	375	0.489
						400	0.497
						425	0.504
						450	0.512
						475	0.519
						500	0.526
						525	0.533
						550	0.540
						575	0.547
						600	0.553



# POLYMETHYLENE POLYPHENYL ISOCYANATE

PPI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> PAPI	Liquid	Dark brown	Weak odor
Sinks in water.			
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Containers may explode in fire. Extinguish with dry chemicals or carbon dioxide. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 12; Isocyanate  
2.2 Formula:  $C_6H_4(NCO)CH_2C_6H_4(NCO)$ -and polymer  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51489

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-line or organic canister mask; goggles or face shield; rubber gloves and other protective clothing to prevent contact with skin.
- 3.2 **Symptoms Following Exposure:** Inhalation causes breathlessness, chest discomfort, and reduced pulmonary function; wheezing, cough, and sputum may also occur. Contact with liquid irritates eyes and skin. Ingestion causes irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention at once following all exposures to this compound.  
INHALATION: remove victim to fresh air; give artificial respiration if breathing has stopped; oxygen can be given by qualified personnel. EYES: immediately wash with large amounts of water for at least 15 min. SKIN: flush immediately with water, wipe off, treat with 30% isopropyl alcohol (rubbing alcohol), and wash with soap and water. INGESTION: induce vomiting at least 3 times by giving warm salt water (one tablespoon of salt per cup); follow with a quart of milk and a mild cathartic such as milk of magnesia.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 1;  $LD_{50}$  = 5 to 15 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 Liquid or Solid Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 425°F O.C.  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Dry chemical or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Containers may explode.  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts slowly, forming heavy scum and liberating carbon dioxide gas. Dangerous pressure can build up if container is sealed.  
5.2 Reactivity with Common Materials: No hazardous reaction unless confined and wet.  
5.3 Stability During Transport: Stable if kept sealed and dry  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 50% methylenebis-phenylisocyanate plus 50% polymer  
7.2 Storage Temperature: 35–125°F  
7.3 Inert Atmosphere: Low-pressure dry nitrogen  
7.4 Venting: Safety relief  
7.5 IMO Pollution Category: D  
7.6 Ship Type: 2  
7.7 Barge Hull Type: 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 400 (approx.)  
9.3 Boiling Point at 1 atm: 392°F = 200°C = 473°K  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.20 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) –13,000 Btu/lb = –7,200 cal/g = –300 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Very low

### NOTES

# POLYMETHYLENE POLYPHENYL ISOCYANATE

PPI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	76.089	51	0.400	52	1.048	33	4348.000
36	76.020	52	0.400	54	1.048	34	3918.000
38	75.950	53	0.400	56	1.048	35	3531.000
40	75.879	54	0.400	58	1.048	36	3184.000
42	75.809	55	0.400	60	1.048	37	2872.000
44	75.740	56	0.400	62	1.048	38	2592.000
46	75.669	57	0.400	64	1.048	39	2340.000
48	75.599	58	0.400	66	1.048	40	2113.000
50	75.530	59	0.400	68	1.048	41	1909.000
52	75.459	60	0.400	70	1.048	42	1726.000
54	75.389	61	0.400	72	1.048	43	1560.000
56	75.320	62	0.400	74	1.048	44	1412.000
58	75.250	63	0.400	76	1.048	45	1277.000
60	75.179	64	0.400	78	1.048	46	1157.000
62	75.110	65	0.400	80	1.048	47	1047.000
64	75.049	66	0.400	82	1.048	48	949.000
66	74.980	67	0.400	84	1.048	49	860.199
68	74.910	68	0.400	86	1.048	50	780.000
70	74.839	69	0.400			51	707.500
72	74.770	70	0.400			52	642.000
74	74.700	71	0.400			53	582.799
76	74.629	72	0.400			54	529.299
78	74.559	73	0.400			55	480.799
80	74.490	74	0.400			56	437.000
82	74.419	75	0.400			57	397.299
84	74.349	76	0.400			58	361.299

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	0.000	60	0.00000		N
	N	70	0.000	70	0.00000		O
	S	80	0.000	80	0.00000		T
	O	90	0.000	90	0.00000		
	L	100	0.000	100	0.00000		P
	U	110	0.000	110	0.00000		E
	B	120	0.000	120	0.00000		R
	I	130	0.000	130	0.00000		T
	E	140	0.000	140	0.00000		I
		150	0.000	150	0.00000		N
		160	0.000	160	0.00000		E
		170	0.000	170	0.00000		N
		180	0.000	180	0.00000		T
	R	190	0.000	190	0.00000		
	E	200	0.000	200	0.00000		
	A	210	0.000	210	0.00000		
	C						
	T						
	S						

# PROPYLENE

PPL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methylethylene Propene	Liquefied compressed gas Colorless Mild odor  Floats and boils on water. Flammable, visible vapor cloud is produced.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Evacuate area in case of large discharge.</b> <b>Avoid contact with liquid.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	<b>FLAMMABLE.</b> Container may explode in fire. Flashback along vapor trail may occur. May explode if ignited in an enclosed area. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water. Let fire burn.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> If inhaled, will cause dizziness or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Will cause frostbite. Flush affected areas with plenty of water. <b>DO NOT RUB AFFECTED AREAS.</b>
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 30; Olefin
- 2.2 Formula:  $\text{CH}_3\text{CH}=\text{CH}_2$
- 2.3 IMO/UN Designation: 2.0/1077
- 2.4 DOT ID No.: 1077
- 2.5 CAS Registry No.: 115-07-1
- 2.6 NAERG Guide No.: 115
- 2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor canister or air-supplied mask; goggles or face shield (for liquid); protective clothing (for liquid).
- 3.2 **Symptoms Following Exposure:** Moderate concentration in air causes dizziness, drowsiness, and unconsciousness. Contact with liquefied propylene will cause "freezing burn."
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; if breathing is irregular or has stopped, start resuscitation; give oxygen; call a doctor.
- 3.4 **TLV-TWA:** Asphyxiant
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin because it evaporates quickly.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
-162°F C.C. (gas)
- 4.2 **Flammable Limits in Air:** 2.0%-11%
- 4.3 **Fire Extinguishing Agents:** Stop flow of gas.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Containers may explode. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 851°F
- 4.8 **Electrical Hazards:** Class I, Group D
- 4.9 **Burning Rate:** 8 mm/min. (liquid)
- 4.10 **Adiabatic Flame Temperature:** 2518. (Est.)
- 4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):**  $\text{N}_2$  diluent: 11.5%;  $\text{CO}_2$  diluent: 14.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Chemical: 92+%; polymerization: 99+%; research: 99+%; propylene concentrate: 80+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2.1
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	1
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 42.08
- 9.3 **Boiling Point at 1 atm:** -53.9°F = 47.7°C = 225.5°K
- 9.4 **Freezing Point:** -301.4°F = -185.2°C = 88°K
- 9.5 **Critical Temperature:** 197.2°F = 91.8°C = 365°K
- 9.6 **Critical Pressure:** 670 psia = 45.6 atm = 4.62 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.609 at -47°C (liquid)
- 9.8 **Liquid Surface Tension:** 16.7 dynes/cm = 0.0167 N/m at -47°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 1.4
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.152
- 9.12 **Latent Heat of Vaporization:** 187 Btu/lb = 104 cal/g = 4.35 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -19,692 Btu/lb = -10,940 cal/g = -458.04 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 17.06 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 227.2 psia

### NOTES

# PROPYLENE

PPL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-145	41.760	-70	0.553		C	-92	0.184
-140	41.550	-60	0.561		U	-90	0.182
-135	41.350				R	-88	0.180
-130	41.140				R	-86	0.178
-125	40.930				E	-84	0.176
-120	40.720				N	-82	0.174
-115	40.510				T	-80	0.172
-110	40.300				L	-78	0.170
-105	40.100				Y	-76	0.168
-100	39.890					-74	0.166
-95	39.680				N	-72	0.165
-90	39.470				O	-70	0.163
-85	39.260				T	-68	0.161
-80	39.060					-66	0.160
-75	38.850				A	-64	0.158
-70	38.640				V	-62	0.156
-65	38.430				A	-60	0.155
-60	38.220				I	-58	0.153
-55	38.020				L	-56	0.152
					A	-54	0.150
					B		
					L		
					E		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	-165	0.251	-165	0.00333	0	0.323
	N	-160	0.325	-160	0.00425	25	0.336
	S	-155	0.417	-155	0.00537	50	0.349
	O	-150	0.531	-150	0.00672	75	0.362
	L	-145	0.669	-145	0.00834	100	0.375
	U	-140	0.837	-140	0.01026	125	0.387
	B	-135	1.037	-135	0.01252	150	0.400
	L	-130	1.276	-130	0.01518	175	0.412
	E	-125	1.559	-125	0.01826	200	0.424
		-120	1.892	-120	0.02183	225	0.436
		-115	2.281	-115	0.02594	250	0.448
		-110	2.732	-110	0.03063	275	0.460
		-105	3.254	-105	0.03597	300	0.472
		-100	3.854	-100	0.04200	325	0.484
		-95	4.540	-95	0.04880	350	0.495
		-90	5.322	-90	0.05643	375	0.507
		-85	6.207	-85	0.06494	400	0.518
		-80	7.207	-80	0.07441	425	0.530
		-75	8.331	-75	0.08489	450	0.541
		-70	9.589	-70	0.09646	475	0.552
		-65	10.990	-65	0.10920	500	0.563
		-60	12.550	-60	0.12310	525	0.574
		-55	14.280	-55	0.13830	550	0.585
		-50	16.190	-50	0.15490	575	0.595
		-45	18.290	-45	0.17290	600	0.606
		-40	20.600	-40	0.19240		

# PHOSPHORUS OXYCHLORIDE

PPO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Phosphoryl chloride	Oily liquid Colorless to light yellow Musty odor
Fumes in air, sinks and reacts with water. Poisonous gas is produced. Freezing point is 34°F.	
Evacuate. Keep people away. Avoid contact with liquid and vapor. Wear chemical protective suit with self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Wear chemical protective suit with self-contained breathing apparatus. DO NOT USE WATER ON ADJACENT FIRES.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove to fresh air. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse dissolved material  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** POCl<sub>3</sub>  
2.3 **IMO/UN Designation:** 8.0/1810  
2.4 **DOT ID No.:** 1810  
2.5 **CAS Registry No.:** 10025-87-3  
2.6 **NAERG Guide No.:** 137  
2.7 **Standard Industrial Trade Classification:** 52241

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles; face shield; self-contained or air-line respirator; hard hat; foot protection; rubber gloves and clothing.
- 3.2 **Symptoms Following Exposure:** Vapors burn eyes and respiratory tract. Liquid is very corrosive to body tissues because of reaction with water to form hydrochloric and phosphoric acids.
- 3.3 **Treatment of Exposure:** CAUTION: persons doing treatments should protect themselves against exposure. **INHALATION:** remove victim from contaminated area at once; if breathing has stopped, start artificial respiration; call a doctor. **INGESTION:** give water or milk; do NOT induce vomiting. **SKIN:** remove contaminated clothing and flood exposed skin surfaces with water. **EYES:** retract eyelids and wash with water for at least 15 min.; call a doctor.
- 3.4 **TLV-TWA:** 0.1 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral rat LD<sub>50</sub> = 380 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Sand and carbon dioxide on adjacent fires
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Poisonous, corrosive, irritating gases are generated when heated or when in contact with water.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Vigorous reaction with evolution of hydrogen chloride fumes.
- 5.2 **Reactivity with Common Materials:** Corrosive to most metals except nickel and lead. Products of its reaction with water rapidly corrode steel and most metals with formation of flammable hydrogen gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, neutralize acids formed with lime or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
**Bioaccumulation:** 0  
**Damage to living resources:** (1)  
**Human Oral hazard:** 2  
**Human Contact hazard:** II  
**Reduction of amenities:** XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99-99.9%
- 7.2 **Storage Temperature:** Above 35°F
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 2              |
| Special (White).....      | W              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCL List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 153.33
- 9.3 **Boiling Point at 1 atm:** 225°F = 107°C = 380°K
- 9.4 **Freezing Point:** 34°F = 1°C = 274°K
- 9.5 **Critical Temperature:** 629.6°F = 332°C = 605.2°K
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.675 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.290
- 9.12 **Latent Heat of Vaporization:** 97 Btu/lb = 54 cal/g = 2.3 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PHOSPHORUS OXYCHLORIDE

PPO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	106.700	85	0.235		N		N
40	106.400	90	0.235		O		O
45	106.099	95	0.235		T		T
50	105.700	100	0.235				
55	105.400	105	0.235		P		P
60	105.099	110	0.235		E		E
65	104.799	115	0.235		R		R
70	104.500	120	0.235		T		T
75	104.200	125	0.235		I		I
80	103.900	130	0.235		N		N
85	103.599	135	0.235		E		E
90	103.200	140	0.235		N		N
95	102.900	145	0.235		T		T
100	102.599	150	0.235				
105	102.299						
110	102.000						
115	101.700						
120	101.400						
125	101.099						
130	100.799						
135	100.400						
140	100.099						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	D	40	0.226	40	0.00646	90	0.058
	E	50	0.311	50	0.00873	100	0.058
	C	60	0.423	60	0.01163	110	0.058
	O	70	0.567	70	0.01529	120	0.058
	M	80	0.750	80	0.01986	130	0.058
	P	90	0.982	90	0.02551	140	0.058
	O	100	1.270	100	0.03242	150	0.058
	S	110	1.626	110	0.04076	160	0.058
	E	120	2.062	120	0.05081	170	0.058
	S	130	2.590	130	0.06275	180	0.058
		140	3.226	140	0.07685	190	0.058
		150	3.986	150	0.09338	200	0.058
		160	4.886	160	0.11260	210	0.058
		170	5.945	170	0.13490	220	0.058
		180	7.185	180	0.16040	230	0.058
		190	8.625	190	0.18960	240	0.058
		200	10.290	200	0.22280	250	0.058
		210	12.210	210	0.26030	260	0.058
		220	14.390	220	0.30250		

# PHOSPHORUS PENTASULFIDE

PPP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Phosphoric sulfide Phosphorus persulfide Thiophosphoric anhydride	Solid-flakes or powder  Yellow to green  Odorless or rotten egg odor  Sinks and reacts with water. Poisonous gas is produced.
<b>Keep people away. Avoid contact with solid and dust. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Evacuate area in case of large discharge. Stay upwind. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE. MAY BE IGNITED BY SPARK, FRICTION, OR STATIC DISCHARGE. Containers may explode in fire. POISONOUS. IRRITATING GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. DO NOT USE WATER. Extinguish with carbon dioxide or sand.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse dissolved material  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $P_2S_5 \cdot P_2S_{10}$   
2.3 IMO/UN Designation: 4.1/1340  
2.4 DOT ID No.: 1340  
2.5 CAS Registry No.: 1314-80-3  
2.6 NAERG Guide No.: 139  
2.7 Standard Industrial Trade Classification: 52242

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles; plastic face shield; self-contained or air-line respirator.
- 3.2 **Symptoms Following Exposure:** Hydrogen sulfide gas formed by reaction with moisture can cause death by respiratory failure. The gas also irritates eyes and respiratory system. The solid irritates skin and eyes; the symptoms may be delayed several hours.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from contaminated area; if breathing has stopped, begin artificial respiration. INGESTION: induce vomiting; call physician. SKIN: remove contaminated clothing and wash areas with large amounts of water. EYES: flush with large amounts of water.
- 3.4 **TLV-TWA:** 1 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 3 mg/m<sup>3</sup>
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Hydrogen sulfide gas, formed by reaction with moisture, causes severe irritation of eyes and throat and can cause eye and lung injury. It cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 0.0047 ppm (hydrogen sulfide). High (lethal) concentrations can paralyze the sense of smell.
- 3.13 **IDLH Value:** 250 mg/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 1 mg/m<sup>3</sup>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Flammable solid
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Sand and carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water
- 4.5 **Special Hazards of Combustion Products:** Products of combustion include sulfur dioxide and phosphorus pentoxide, which are irritating, toxic and corrosive.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 288°F.
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 107.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 9.3%; CO<sub>2</sub> diluent: 12.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with liquid water or atmospheric moisture to liberate toxic hydrogen sulfide gas.
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Can be ignited by friction.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** "Regular" (low reactivity), "reactive" (high reactivity), distilled, undistilled; all 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Sealed containers must be stored in a well-ventilated area
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Dangerous When Wet
- 8.2 **49 CFR Class:** 4.3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 2              |
| Special (White).....      | W              |
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U189
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 222.27
- 9.3 **Boiling Point at 1 atm:** 957°F = 514EKC = 787°K
- 9.4 **Freezing Point:** 527°F = 275°C = 548°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.03 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** 184 Btu/lb = 102 cal/g = 4.27 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -10,890 Btu/lb = -6,050 cal/g = -253.3 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) -20 Btu/lb = -12 cal/g = -0.5 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PHOSPHORUS PENTASULFIDE

PPP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# PHOSPHORUS, RED

PPR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Amorphous phosphorus	Solid powder Reddish brown Odorless  Sinks in water.
<b>Keep people away. AVOID CONTACT WITH SOLID.</b> <b>Wear rubber overclothing (including gloves).</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE. POISONOUS, IRRITATING AND FLAMMABLE GASES ARE PRODUCED IN FIRE. Wear rubber overclothing (including gloves). Flood discharge area with water. Cool exposed containers with water. Continue cooling after the fire has been extinguished.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Will burn eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 0; Unassigned cargoes  
**2.2 Formula:** P  
**2.3 IMO/UN Designation:** 4.1/1338  
**2.4 DOT ID No.:** 1338  
**2.5 CAS Registry No.:** 7723-14-0  
**2.6 NAERG Guide No.:** 133  
**2.7 Standard Industrial Trade Classification:** 52222

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Dust mask; gloves of rubber or vinyl; chemical safety glasses; rubber shoes.  
**3.2 Symptoms Following Exposure:** Physically irritating to eyes, otherwise essentially harmless and non-toxic unless contaminated by highly toxic yellow phosphorus as an impurity.  
**3.3 Treatment of Exposure:** EYES: flush thoroughly with water and get medical attention. SKIN: flush with water and wash with soap and water. CAUTION: Avoid brushing, as friction may ignite material on skin or clothing.  
**3.4 TLV-TWA:** 0.02 ppm  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Currently not available  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Nonvolatile  
**3.11 Liquid or Solid Characteristics:** Currently not available  
**3.12 Odor Threshold:** Odorless  
**3.13 IDLH Value:** 5 mg/m<sup>3</sup>  
**3.14 OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup>  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:**  
Flammable solid  
**4.2 Flammable Limits in Air:** Not pertinent  
**4.3 Fire Extinguishing Agents:** Water  
**4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent  
**4.5 Special Hazards of Combustion**  
**Products:** Heat may cause reversion to yellow phosphorus which is toxic and spontaneously flammable upon contact with air. Burning yields toxic oxides of phosphorus.  
**4.6 Behavior in Fire:** Refer to 6.5  
**4.7 Auto Ignition Temperature:** 500°F  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** Not pertinent  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 5.9 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 0.5 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:**  
Avoid uncontrolled contact with oxidizing agents (chlorates, nitrates, halogens, etc.) or with strong alkaline hydroxides. Can react violently with oxidizing agent in presence of air and moisture, liberating phosphorus acids and toxic, spontaneously flammable phosphine gas.  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
0.105 ppm/48 hr/bluegill/TL<sub>50</sub>/fresh water  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):**  
Currently not available  
**6.4 Food Chain Concentration Potential:**  
None  
**6.5 GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 99.9% Technical  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable solid  
**8.2 49 CFR Class:** 4.1  
**8.3 49 CFR Package Group:** III  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	1

**8.6 EPA Reportable Quantity:** 1 pound  
**8.7 EPA Pollution Category:** X  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Solid  
**9.2 Molecular Weight:** 123.89  
**9.3 Boiling Point at 1 atm:** Catches fire  
**9.4 Freezing Point:** Not pertinent  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 2.20 at 20°C (solid)  
**9.8 Liquid Surface Tension:** Not pertinent  
**9.9 Liquid Water Interfacial Tension:** Not pertinent  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
**9.12 Latent Heat of Vaporization:** Not pertinent  
**9.13 Heat of Combustion:** Not pertinent  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# PHOSPHORUS, RED

PPR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# PHOSPHORUS TRICHLORIDE

PPT

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid

Colorless to slightly  
yellow

Sharp irritating  
odor

Fumes in air, sinks and reacts with water. Harmful vapor is produced.

Evacuate.  
Keep people away. **AVOID CONTACT WITH LIQUID AND VAPOR.**  
Wear goggles, self-contained breathing apparatus, and rubber overclothing  
(including gloves).  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
Wear goggles, self-contained breathing apparatus, and rubber overclothing  
(including gloves).  
**DO NOT USE WATER ON ADJACENT FIRES.**  
Extinguish adjacent fires with carbon dioxide or dry chemical.

### Exposure

**CALL FOR MEDICAL AID.**

**VAPOR**  
Irritating to eyes, nose, and throat.  
Harmful if inhaled.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

**LIQUID**  
Will burn skin and eyes.  
Poisonous if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water  
or milk.  
**DO NOT INDUCE VOMITING.**

### Water Pollution

Dangerous to aquatic life in high concentrations.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse dissolved material  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

## 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** PCl<sub>3</sub>  
2.3 **IMO/UN Designation:** 8.0/1809  
2.4 **DOT ID No.:** 1809  
2.5 **CAS Registry No.:** 7719-12-2  
2.6 **NAERG Guide No.:** 137  
2.7 **Standard Industrial Trade Classification:**  
52241

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles; plastic face shield; self-contained or air-line respirator; safety hat; rubber gloves and protective clothing.
- 3.2 **Symptoms Following Exposure:** Vapors cause severe irritation of eyes and respiratory tract. Liquid burns eyes and skin.
- 3.3 **Treatment of Exposure:** CAUTION: Persons doing treatment should protect themselves.  
INHALATION: remove victim from contaminated area; if breathing has stopped, start artificial respiration; call a doctor. INGESTION: if victim is conscious, give large quantities of water; do NOT induce vomiting; call a doctor. EYES: retract eyelids and wash eyes with water for at least 15 min.; call a doctor. SKIN: remove contaminated clothing and wash exposed skin with water.
- 3.4 **TLV-TWA:** 0.2 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 0.5 ppm  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 550 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 25 ppm  
3.14 **OSHA PEL-TWA:** 0.5 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Sand, carbon dioxide and dry chemicals on adjacent fires
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Generates toxic, irritating gases
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently and may cause flashes of fire. Hydrochloric acid fumes are formed in the reaction.
- 5.2 **Reactivity with Common Materials:** Corrodes most common construction materials. Reacts with water to form hydrochloric acid, which reacts with most metals to form flammable hydrogen gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; neutralize acids formed with lime or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (1)  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure: 99.5+%; technical: 98.5+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 2              |
| Special (White).....      | W              |
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 137.33
- 9.3 **Boiling Point at 1 atm:** 169°F = 76°C = 349°K
- 9.4 **Freezing Point:** -170°F = -112°C = 161°K
- 9.5 **Critical Temperature:** 546.8°F = 286°C = 559.2°K
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.575 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 25.6 dynes/cm = 0.0256 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 4.7
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.290
- 9.12 **Latent Heat of Vaporization:** 95 Btu/lb = 53 cal/g = 2.2 X 10<sup>4</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# PHOSPHORUS TRICHLORIDE

PPT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	100.500	50	0.260		N		N
40	100.200	52	0.260		O		O
45	99.830	54	0.260		T		T
50	99.500	56	0.260				
55	99.169	58	0.260		P		P
60	98.839	60	0.260		E		E
65	98.509	62	0.260		R		R
70	98.179	64	0.260		T		T
75	97.849	66	0.260		I		I
80	97.530	68	0.260		N		N
85	97.200	70	0.260		E		E
90	96.870	72	0.260		N		N
95	96.540	74	0.260		T		T
100	96.209	76	0.260				
105	95.879	78	0.260				
110	95.549	80	0.260				
115	95.219	82	0.260				
120	94.889	84	0.260				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	D	70	2.057	70	0.04969	100	0.000
	E	75	2.323	75	0.05559	120	0.000
	C	80	2.618	80	0.06207	140	0.000
	O	85	2.944	85	0.06915	160	0.000
	M	90	3.303	90	0.07688	180	0.000
	P	95	3.699	95	0.08531	200	0.000
	O	100	4.133	100	0.09448	220	0.000
	S	105	4.610	105	0.10440	240	0.000
		110	5.131	110	0.11520	260	0.000
		115	5.701	115	0.12690	280	0.000
		120	6.323	120	0.13950	300	0.000
		125	7.000	125	0.15320	320	0.000
		130	7.736	130	0.16780	340	0.000
		135	8.535	135	0.18360	360	0.000
		140	9.401	140	0.20060	380	0.000
		145	10.340	145	0.21870	400	0.000
		150	11.350	150	0.23820	420	0.000
		155	12.450	155	0.25910	440	0.000
		160	13.630	160	0.28130		
		165	14.890	165	0.30500		
		170	16.260	170	0.33030		
		175	17.720	175	0.35730		
		180	19.300	180	0.38590		
		185	20.980	185	0.41630		
		190	22.780	190	0.44850		
		195	24.700	195	0.48270		

# PHOSPHORUS, WHITE

PPW

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Yellow phosphorus	Waxy solid Light yellow Garlic odor  Fumes and burns in air, sinks in water.
Evacuate. Keep people away. <b>AVOID CONTACT WITH SOLID.</b> Wear rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. May ignite on contact with air. POISONOUS, IRRITATING GASES ARE PRODUCED IN FIRE. Wear rubber overclothing (including gloves). Flood discharge area with water. Cool exposed containers with water. Continue cooling after fire has been extinguished.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Will burn skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS WITH NO CONVULSIONS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 0; Unassigned cargoes  
2.2 **Formula:** P  
2.3 **IMO/UN Designation:** 4.2/1381  
2.4 **DOT ID No.:** 1381  
2.5 **CAS Registry No.:** 7723-14-0  
2.6 **NAERG Guide No.:** 136  
2.7 **Standard Industrial Trade Classification:** 5222

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Heavy rubber gloves and goggles or face shield.  
3.2 **Symptoms Following Exposure:** Solid or liquid causes severe burns of skin. If ingested, causes nausea, vomiting, jaundice, low blood pressure, depression, delirium, coma, death. Symptoms after ingestion may be delayed for from a few hours to 3 days.  
3.3 **Treatment of Exposure:** INGESTION: if ingested, do NOT induce vomiting; call a doctor at once. SKIN OR EYE CONTACT: immediately flush with plenty of water for at least 15 min.; keep skin area wet until medical attention is obtained.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> below 50 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Severe attack of liver and bones.  
3.10 **Vapor (Gas) Irritant Characteristics:** Nonvolatile  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact, and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Ignites spontaneously in air.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Fumes from burning phosphorus are highly irritating.  
4.6 **Behavior in Fire:** Intense white smoke is formed.  
4.7 **Auto Ignition Temperature:** 86°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 5.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 0.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Ignites when exposed to air.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.105 ppm/48 hr/bluegill/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.8-99.9%  
7.2 **Storage Temperature:** Elevated  
7.3 **Inert Atmosphere:** Padded  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 1  
7.7 **Barge Hull Type:** 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Spontaneously Combustible  
8.2 **49 CFR Class:** 4.2  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	4
Instability (Yellow).....	2

  
8.6 **EPA Reportable Quantity:** 1 pound  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 123.89  
9.3 **Boiling Point at 1 atm:** 535.5°F = 279.7°C = 552.9°K  
9.4 **Freezing Point:** 111.4°F = 44.1°C = 317.3°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.82 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 4.8 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Very low

### NOTES

# PHOSPHORUS, WHITE

PPW

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# PIPERAZINE

PPZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diethylenediamine Hexahydro-1,4-diazine Hexahydropyrazine Lumbical Piperazidine Pyrazine hexahydride	Solid  White  Mild, fishy odor  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn eyes. Irritating to eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{NHCH}_2\text{CH}_2\text{NHCH}_2\text{CH}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2579  
2.5 CAS Registry No.: 110-85-0  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51577

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Monogoggles or face shield; rubber gloves; dust mask  
3.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach; has been known to cause severe allergic reaction. Contact with eyes causes burns. Repeated contact with skin may cause irritation and sensitization.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water; induce vomiting; get medical attention. EYES: flush with plenty of water for at least 15 min.; get medical attention. SKIN: wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5\text{-}5 \text{ g/kg}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 178°F O.C. (molten solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, "alcohol" foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 851°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May be corrosive to aluminum, magnesium, and zinc  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 99+%; may also be shipped as a solid hexa-hydrate, whose hazardous properties are similar.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 86  
9.3 **Boiling Point at 1 atm:** 299°F = 148°C = 421°K  
9.4 **Freezing Point:** 223°F = 106°C = 379°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.1 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -14,800 Btu/lb = -8,200 cal/g = -343 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -34.9 Btu/lb = -19.4 cal/g = -0.812 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PIPERAZINE

PPZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E	70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300	0.017 0.026 0.038 0.056 0.082 0.117 0.166 0.232 0.321 0.440 0.598 0.803 1.070 1.412 1.849 2.401 3.096 3.962 5.035 6.357 7.974 9.942 12.320 15.190	70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300	0.00025 0.00038 0.00056 0.00080 0.00115 0.00162 0.00225 0.00310 0.00422 0.00569 0.00760 0.01006 0.01319 0.01715 0.02212 0.02831 0.03596 0.04536 0.05684 0.07077 0.08756 0.10770 0.13170 0.16020		N O T  P E R T I N E N T



# N-PROPYLAMINE

PRA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Aminopropane Mono-n-propylamine 1-Propylamine	Watery liquid  Colorless  Ammonia odor  Floats and mixes with water. Flammable, irritating vapor is produced.
<b>Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Irritating vapors are produced when heated. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Chemical and Physical Treatment:  
Absorb

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amine  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_2\text{NH}_2$   
2.3 IMO/UN Designation: 3.1/1277  
2.4 DOT ID No.: 1277  
2.5 CAS Registry No.: 107-10-8  
2.6 NAERG Guide No.: 132  
2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber or plastic gloves, splash-proof goggles or face shield. Protective equipment that will prevent contact of liquid or vapor with eyes, skin, and respiratory tract.
- 3.2 **Symptoms Following Exposure:** INHALATION: Mucous membrane and respiratory tract irritation. Tracheitis, bronchitis, pneumonitis, and pulmonary edema. EYES: Severe corneal damage or complete eye destruction. SKIN: Single drop-deep necrosis. INGESTION: Corrosive to G.I. tract.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove to fresh air. If not breathing, give artificial respiration. Give oxygen if breathing is difficult. EYES: 15-Minute emergency eye washing. See physician as soon as possible. SKIN: Wash with soap and water. Flush for at least 15 minutes. Remove contaminated clothing. INGESTION: Wash mouth, drink water, get medical aid.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2:  $\text{LD}_{50}$  = 0.5 to 5 g/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Weight loss, corneal opacities, and deaths occurred in laboratory animals exposed repeatedly to 800 ppm. A weak allergen.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third- degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  $-35^\circ\text{F}$  C.C.  
4.2 **Flammable Limits in Air:** 2% to 10.4%  
4.3 **Fire Extinguishing Agents:** Use dry chemical, alcohol foam, or  $\text{CO}_2$ . Dilution with water will reduce intensity of flame.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion**  
Products: Extreme danger, enter with great care. Thermal decomposition may produce nitrogen oxides, CO and/or  $\text{CO}_2$ .  
4.6 **Behavior in Fire:** Keep away from heat and open flame; can react vigorously.  
4.7 **Auto Ignition Temperature:**  $604^\circ\text{F}$   
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 29.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Finfish toxicity critical concentration = 20 mg/l  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99% (minimum)  
7.2 **Storage Temperature:** Cool  
7.3 **Inert Atmosphere:** Inert  
7.4 **Venting:** PV  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 5000 pounds  
8.7 EPA Pollution Category: D  
8.8 RCRA Waste Number: U194  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at  $15^\circ\text{C}$  and 1 atm:** Solid  
9.2 **Molecular Weight:** 59.11  
9.3 **Boiling Point at 1 atm:**  $119.5^\circ\text{F} = 48.6^\circ\text{C} = 321.8^\circ\text{K}$   
9.4 **Freezing Point:**  $-117.4^\circ\text{F} = -83^\circ\text{C} = 190.2^\circ\text{K}$   
9.5 **Critical Temperature:**  $434.8^\circ\text{F} = 223.8^\circ\text{C} = 497^\circ\text{K}$   
9.6 **Critical Pressure:** 687.8 psia = 46.8 atm = 4.74 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.7182 at  $20^\circ\text{C}$   
9.8 **Liquid Surface Tension:** 57.72 dynes/cm = 0.05772 N/m at  $20^\circ\text{C}$   
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.04  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 219.4 Btu/lb = 121.9 cal/g =  $5.1 \times 10^5$  J/kg  
9.13 **Heat of Combustion:**  $-15,773$  Btu/lb =  $-8763$  cal/g =  $-366.6 \times 10^3$  J/kg  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 10.4

### NOTES

# N-PROPYLAMINE

PRA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	45.430		C		C		C
55	45.263		U		U		U
60	45.097		R		R		R
65	44.930		R		R		R
70	44.763		E		E		E
75	44.597		N		N		N
80	44.430		T		T		T
85	44.263		L		L		L
90	44.097		Y		Y		Y
95	43.930						
100	43.763		N		N		N
			O		O		O
			T		T		T
			A		A		A
			V		V		V
			A		A		A
			I		I		I
			L		L		L
			A		A		A
			B		B		B
			L		L		L
			L		L		L
			E		E		E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	-80	-4.289	5	0.01063	80	0.389
	I	-70	-3.277	10	0.01195	100	0.399
	S	-60	-2.264	15	0.01344	120	0.409
	C	-50	-1.252	20	0.01511	140	0.419
	I	-40	-0.239	25	0.01699	160	0.429
	B	-30	0.773	30	0.01910	180	0.439
	L	-20	0.215	35	0.02148	200	0.449
	E	-10	1.202	40	0.02415	220	0.459
		0	2.190	45	0.02716	240	0.469
		10	3.178	50	0.03053	260	0.479
		20	4.165	55	0.03433	280	0.489
		30	5.153	60	0.03861	300	0.499
		40	6.140	65	0.04341	320	0.509
		50	7.128	70	0.04881	340	0.519
		60	8.116	75	0.05488	360	0.529
		70	9.103	80	0.06171	380	0.539
		80	10.091	85	0.06939	400	0.549
		90	11.079	90	0.07803	420	0.559
		100	12.066	95	0.08773	440	0.569
		110	13.054	100	0.09865		
		120	14.041	105	0.11093		
		130	15.029	110	0.12473		
		140	16.017	115	0.14025		
		150	17.004				

# N-PROPYL CHLORIDE

PRC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Chloropropane Propane, chloro-	Liquid  Colorless  Chloroform-like  Floats on water.
<b>Fire</b>  Wear full impervious protective clothing and approved respirator. Keep people away. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Exposure</b>	Flammable. Vapors can flow to distant ignition source and flash back. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, or carbon dioxide. Use water spray to cool exposed containers.  CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Contain  
Collection Systems: Skim

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{C}_3\text{H}_7\text{Cl}$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: 1278  
2.5 CAS Registry No.: 540-54-5  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51134

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat. May cause nausea, headache, and vomiting. High concentrations may have a narcotic effect.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 0°F C.C.  
4.2 **Flammable Limits in Air:** LEL: 2.6%; UEL: 11.0%  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as hydrogen chloride and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Vapors can flow along surfaces to distant ignition source and flash back.  
4.7 **Auto Ignition Temperature:** 968°F.  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Incompatible with strong oxidizers.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%; technical.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable Liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 78.54  
9.3 **Boiling Point at 1 atm:** 115- 117°F = 46 - 47°C = 319 - 320°K  
9.4 **Freezing Point:** -189°F = -123°C = 150°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.892  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 2.71  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N-PROPYL CHLORIDE

PRC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# PYRIDINE

PRD

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless to yellow	Sharp, nauseating odor
Mixes with water. Poisonous, flammable vapor is produced.			
<p>Evacuate.</p> <p>Keep people away. <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b></p> <p>Wear chemical protective suit with self-contained breathing apparatus.</p> <p>Shut off ignition sources and call fire department.</p> <p>Stay upwind and use water spray to "knock down" vapor.</p> <p>Notify local health and pollution control agencies.</p> <p>Protect water intakes.</p>			
Fire	<p>FLAMMABLE.</p> <p>Flashback along vapor trail may occur.</p> <p>Vapor may explode if ignited in an enclosed area.</p> <p>Wear chemical protective suit with self-contained breathing apparatus.</p> <p>Extinguish with dry chemical, alcohol foam, or carbon dioxide.</p> <p>Water may be ineffective on fire.</p> <p>Cool exposed containers with water.</p>		
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR</p> <p>Poisonous if inhaled or if skin is exposed.</p> <p>Irritating to eyes, nose and throat.</p> <p>Move to fresh air.</p> <p>If breathing has stopped, give artificial respiration.</p> <p>If breathing is difficult, give oxygen.</p> <p>LIQUID</p> <p>Poisonous if swallowed or if skin is exposed.</p> <p>Will burn eyes.</p> <p>Remove contaminated clothing and shoes.</p> <p>Flush affected areas with plenty of water.</p> <p>IF IN EYES, hold eyelids open and flush with plenty of water.</p> <p>IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.</p> <p>IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>		
Water Pollution	<p>Dangerous to aquatic life in high concentrations.</p> <p>May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials.</p> <p>Notify operators of nearby water intakes.</p>		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 9; Aromatic amine
- 2.2 Formula: C<sub>5</sub>H<sub>5</sub>N
- 2.3 IMO/UN Designation: 3.2/1282
- 2.4 DOT ID No.: 1282
- 2.5 CAS Registry No.: 110-86-1
- 2.6 NAERG Guide No.: 129
- 2.7 Standard Industrial Trade Classification: 51574

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask or organic canister; vapor-proof goggles; rubber gloves and protective clothing.
- 3.2 **Symptoms Following Exposure:** Vapor irritates eyes and nose. Liquid irritates skin and is absorbed through the skin. Overexposure causes nausea, headache, nervous symptoms, increased urinary frequency.
- 3.3 **Treatment of Exposure:** INHALATION: remove individual promptly from contaminated area; give artificial respiration and oxygen if necessary; treat symptomatically. INGESTION: induce vomiting and follow with gastric lavage. SKIN: wash thoroughly with large amounts of water. EYES: irrigate with water for at least 15 min.
- 3.4 TLV-TWA: 5 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Liver and kidney damage after ingestion.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** 0.021 ppm
- 3.13 **IDLH Value:** 1,000 ppm
- 3.14 **OSHA PEL-TWA:** 5 ppm
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 68°F C.C.
- 4.2 **Flammable Limits in Air:** 1.8%-12.4%
- 4.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 900°F
- 4.8 **Electrical Hazards:** Class I, Group D
- 4.9 **Burning Rate:** 4.3 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 34.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** None
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 1350 mg/l/96 hr/fish/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 1.15-1.47 lb/lb, 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 1/BOD  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; Pure
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** U196/D038
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 79.10
- 9.3 **Boiling Point at 1 atm:** 239.5°F = 115.3°C = 388.5°K
- 9.4 **Freezing Point:** -44°F = -42°C = 231°K
- 9.5 **Critical Temperature:** 656.2°F = 346.8°C = 620°K
- 9.6 **Critical Pressure:** 817.3 psia = 55.6 atm = 5.63 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.983 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 38.0 dynes/cm = 0.038 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 2.73
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.123
- 9.12 **Latent Heat of Vaporization:** 193 Btu/lb = 107 cal/g = 4.48 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -14,390 Btu/lb = -7992 cal/g = -334.6 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) -13 Btu/lb = -7 cal/g = -0.3 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.77 psia

### NOTES

# PYRIDINE

PRD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	62.320	0	0.390		N		N
40	62.150	10	0.393		O		O
45	61.970	20	0.396		T		T
50	61.800	30	0.399				
55	61.630	40	0.402		P		P
60	61.450	50	0.406		E		E
65	61.280	60	0.409		R		R
70	61.100	70	0.412		T		T
75	60.930	80	0.415		I		I
80	60.760	90	0.418		N		N
85	60.580	100	0.421		E		E
90	60.410	110	0.425		N		N
95	60.240	120	0.428		T		T
100	60.060	130	0.431				
105	59.890	140	0.434				
110	59.720	150	0.437				
115	59.540	160	0.440				
120	59.370	170	0.444				
125	59.200	180	0.447				
130	59.020	190	0.450				
135	58.850	200	0.453				
140	58.680	210	0.456				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	60	0.233	60	0.00331	0	0.193
	I	70	0.322	70	0.00449	25	0.206
	S	80	0.439	80	0.00600	50	0.219
	C	90	0.590	90	0.00791	75	0.232
	I	100	0.782	100	0.01030	100	0.245
	B	110	1.024	110	0.01325	125	0.257
	L	120	1.326	120	0.01685	150	0.269
	E	130	1.698	130	0.02122	175	0.281
		140	2.153	140	0.02645	200	0.293
		150	2.703	150	0.03267	225	0.304
		160	3.364	160	0.04001	250	0.315
		170	4.152	170	0.04859	275	0.325
		180	5.084	180	0.05857	300	0.336
		190	6.178	190	0.07008	325	0.346
		200	7.455	200	0.08327	350	0.355
		210	8.935	210	0.09832	375	0.365
		220	10.640	220	0.11540	400	0.374
		230	12.600	230	0.13460	425	0.383
		240	14.830	240	0.15620	450	0.392
		250	17.360	250	0.18020	475	0.401
		260	20.220	260	0.20700	500	0.409
		270	23.430	270	0.23660	525	0.417
		280	27.030	280	0.26920	550	0.425
		290	31.040	290	0.30510	575	0.433
		300	35.490	300	0.34420	600	0.440

# N-PROPYL ETHER

PRE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dipropyl ether Di-n-propyl ether	Liquid Colorless  Floats on water.
Wear full impervious protective clothing and approved respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Flammable. Vapors can flow to distant ignition source and flash back. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 41; Ethers  
2.2 Formula: (CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>)<sub>2</sub>O  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: 2384  
2.5 CAS Registry No.: 111-43-3  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Currently not available
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 70°F O.C.  
4.2 **Flammable Limits in Air:** 1.3 - 7.0%  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Vapors can flow along surfaces to distant ignition source and flash back.  
4.7 **Auto Ignition Temperature:** 370°F.  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Tends to form explosive peroxides, especially when anhydrous.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: -  
Human Contact hazard: I  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%; technical.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 102.17  
9.3 **Boiling Point at 1 atm:** 192 - 196°F = 89 - 91°C = 362 - 364°K  
9.4 **Freezing Point:** -187.6°F = -122°C = 151°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.7360  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N-PROPYL ETHER

PRE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	68	1.064	68	0.01918		C U R R E N T L Y  N O T  A V A I L A B L E



# PROPARGITE

PRG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> DO 14 Naugatuck DO 14 Omite Propargil		Liquid  Dark amber   Sinks slowly in water.
Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	FLAMMABLE. Poisonous, irritating gases are produced in fire. Containers may rupture in fire. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with water, carbon dioxide, dry chemicals or alcohol foam.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID. Irritating to skin and eyes. Harmful if swallowed. Poisonous if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $C_{10}H_{16}O_3S$ 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 3000 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: 152 2.7 Standard Industrial Trade Classification: 51549
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Rubber gloves and boots, safety goggles or face mask, hooded suit and either a respirator with approved canister or a self-contained breathing apparatus. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Irritation of mucous membranes. EYES: Irritation, may be severe. SKIN: Irritation. 3.3 <b>Treatment of Exposure:</b> Call a physician. INHALATION: Move to fresh air. EYES: Flush with water. SKIN: Wash. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; $LD_{50} = 0.5$ to 5 g/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 82°F.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water fog, carbon dioxide, dry chemical or alcohol foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion**  
**Products:** Irritating fumes of sulfur oxides are produced.
- 4.6 **Behavior in Fire:** Containers may rupture in fire conditions and may decompose to corrosive  $SO_2$ .
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 116.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 33.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.031 ppm/96 hr/bluegill sunfish/ $LD_{50}$   
0.445 ppm/96 hr/rainbow trout/ $LD_{50}$   
0.33 ppm/48 hr/carp/ $TL_{m}/static$   
 $LD_{50}$ .
- 6.2 **Waterfowl Toxicity:** >4640 mg/kg, Mallard  $LD_{50}$ .
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical - at least 80%. 30% wettable powder. 4% dust.
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 350.472
- 9.3 **Boiling Point at 1 atm:** Decomposes.
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.085-1.115 at 20°C.
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# PROPARGITE

PRG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# PROPARGYL ALCOHOL

PRO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethynyl carbinol Ethynyl methanol Propiolic alcohol 1-Propyne-3-ol 2-Propyn-1-ol Propynyl alcohol	Liquid  Colorless  Geranium odor  Floats on water.
<b>Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Wear self-contained breathing apparatus and full protective clothing. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	COMBUSTIBLE. Containers may explode in fire. Flashback may occur along vapor trail. Forms explosive mixtures in air. Water may be ineffective against fire. Wear self-contained breathing apparatus and full protective clothing. Extinguish with CO <sub>2</sub> , dry chemical, or alcohol foam.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR May be harmful or fatal if inhaled or absorbed through the skin. Causes severe irritation of the eyes, nose, and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID May be harmful or fatal if swallowed or absorbed through the skin. Extremely irritating to the eyes and skin. Remove contaminated clothing and shoes. Flush affected areas with plenty of running water. IF IN EYES: flush with running water for at least 15 minutes. IF SWALLOWED: DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. Fouling to shoreline. May be dangerous if it enters local water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: HC≡CCH<sub>2</sub>OH
- 2.3 IMO/UN Designation: /1986
- 2.4 DOT ID No.: 1986
- 2.5 CAS Registry No.: 107-19-7
- 2.6 NAERG Guide No.: 131
- 2.7 Standard Industrial Trade Classification: 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, chemical resistant gloves, safety goggles, full protective clothing.
- 3.2 **Symptoms Following Exposure:** Severe health hazard. Central nervous system depressant. May be fatal if absorbed through skin or inhaled. Causes severe irritation. High concentrations are extremely destructive to mucous membranes, upper respiratory tract, eyes and skin. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES AND SKIN: Remove contaminated clothing and shoes. Flush affected areas with running water for at least 15 minutes. INGESTION: Do not induce vomiting.
- 3.4 TLV-TWA: 1 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> = 20 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Central nervous system depressant.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 97°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Alcohol foam, CO<sub>2</sub>, dry chemical.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective against fire.
- 4.5 **Special Hazards of Combustion Products:** Acid smoke, fumes
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Class I, Group undesignated
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 16.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** May undergo autopolymerization
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Refrigerate
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** None
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid
- 8.2 49 CFR Class: 3
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	3
Instability (Yellow).....	3
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: P102
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 56.07
- 9.3 **Boiling Point at 1 atm:** 237°F = 114°C = 387°K
- 9.4 **Freezing Point:** -54°F = -48°C = 225°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.9485 at 20°C
- 9.8 **Liquid Surface Tension:** 36 dyne/cm = 0.036 Nm at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 1.93
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PROPARGYL ALCOHOL

PRO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	59.210		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	68	1.680

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# PROPANE

PRP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dimethylmethane	Liquefied flammable gas	Colorless	Odorless-may have skunk odor added
Liquid floats and boils on water. Flammable visible vapor cloud is produced.			
Evacuate. Keep people away. Avoid contact with liquid and gas. Avoid inhalation. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.			
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Stop flow of gas if possible. Cool exposed containers and protect men effecting shut-off with water. Let fire burn.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Not irritating to eyes, nose or throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID May cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.		
<b>Water Pollution</b>	Not harmful to aquatic life.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 31; Paraffin  
2.2 Formula: CH<sub>3</sub>CH<sub>2</sub>CH<sub>3</sub>  
2.3 IMO/UN Designation: 2.0/1978  
2.4 DOT ID No.: 1978  
2.5 CAS Registry No.: 74-98-6  
2.6 NAERG Guide No.: 115  
2.7 Standard Industrial Trade Classification: 51114

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus for high concentrations of gas.  
3.2 **Symptoms Following Exposure:** Vaporizing liquid may cause frostbite. Concentrations in air greater than 10% cause dizziness in a few minutes. 1% concentrations give the same effect in 10 min. High concentrations cause asphyxiation.  
3.3 **Treatment of Exposure:** Remove to open air. If victim is overcome by gas, apply artificial respiration. Guard against self-injury if confused.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Not pertinent  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin because it evaporates quickly.  
3.12 **Odor Threshold:** 5,000-20,000 ppm  
3.13 **IDLH Value:** 2,100 ppm  
3.14 **OSHA PEL-TWA:** 1,000 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
-156°F C.C. (gas)  
4.2 **Flammable Limits in Air:** 2.1%-9.5%  
4.3 **Fire Extinguishing Agents:** Stop flow of gas. For small fires use dry chemicals. Cool adjacent areas with water spray.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Containers may explode. Vapor is heavier than air and may travel a long distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 842°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 8.2 mm/min.  
4.10 **Adiabatic Flame Temperature:** 2419. (Est.)  
4.11 **Stoichiometric Air to Fuel Ratio:** 23.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 11.4-11.5%; CO<sub>2</sub> diluent: 14.5%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None  
6.2 **Waterfowl Toxicity:** None  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research; instrument, or Pure: 99.35+ % Technical: 97.50 %  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas  
8.2 **49 CFR Class:** 2.1  
8.3 **49 CFR Package Group:** Not pertinent.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
9.2 **Molecular Weight:** 44.09  
9.3 **Boiling Point at 1 atm:** -43.8°F = -42.1°C = 231.1°K  
9.4 **Freezing Point:** -305.9°F = -187.7°C = 85.5°K  
9.5 **Critical Temperature:** 206.0°F = 96.67°C = 369.87°K  
9.6 **Critical Pressure:** 616.5 psia = 41.94 atm = 4.249 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.590 at -50°C (liquid)  
9.8 **Liquid Surface Tension:** 16 dynes/cm = 0.016 N/m at -47°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at -50°C  
9.10 **Vapor (Gas) Specific Gravity:** 1.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.130  
9.12 **Latent Heat of Vaporization:** 183.2 Btu/lb = 101.8 cal/g = 4.262 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -19,782 Btu/lb = -10,990 cal/g = -460.13 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 190 psia

### NOTES

# PROPANE

PRP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-180	41.480	-50	0.546		N O T  P E R T I N E N T	-145	0.433
-175	41.290					-140	0.413
-170	41.100					-135	0.395
-165	40.910					-130	0.378
-160	40.720					-125	0.362
-155	40.530					-120	0.347
-150	40.340					-115	0.333
-145	40.150					-110	0.321
-140	39.960					-105	0.309
-135	39.770					-100	0.297
-130	39.580					-95	0.287
-125	39.390					-90	0.277
-120	39.190					-85	0.268
-115	39.000					-80	0.259
-110	38.810					-75	0.251
-105	38.620					-70	0.243
-100	38.430					-65	0.236
-95	38.240					-60	0.229
-90	38.050					-55	0.222
-85	37.860					-50	0.216
-80	37.670					-45	0.210
-75	37.480						
-70	37.290						
-65	37.100						
-60	36.910						
-55	36.720						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		-230	0.002	-230	0.00003	0	0.349
		-220	0.004	-220	0.00007	25	0.365
		-210	0.009	-210	0.00015	50	0.381
		-200	0.019	-200	0.00031	75	0.397
		-190	0.039	-190	0.00060	100	0.413
		-180	0.074	-180	0.00109	125	0.429
		-170	0.134	-170	0.00190	150	0.444
		-160	0.230	-160	0.00315	175	0.459
		-150	0.380	-150	0.00504	200	0.474
		-140	0.605	-140	0.00777	225	0.489
		-130	0.931	-130	0.01160	250	0.504
		-120	1.393	-120	0.01685	275	0.519
		-110	2.029	-110	0.02384	300	0.533
		-100	2.886	-100	0.03296	325	0.548
		-90	4.017	-90	0.04463	350	0.562
		-80	5.480	-80	0.05929	375	0.576
		-70	7.344	-70	0.07741	400	0.590
		-60	9.680	-60	0.09948	425	0.603
		-50	12.570	-50	0.12600	450	0.617
		-40	16.090	-40	0.15750	475	0.630
		-30	20.340	-30	0.19440	500	0.643
		-20	25.400	-20	0.23730	525	0.657
						550	0.669
						575	0.682
						600	0.695

# PYRETHRINS

PRR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dalmation-insect powder Persian-insect powder Pyrethrum flowers	Viscous liquid  Sinks in water.	Yellow to brown  Characteristic odor of carrier
<b>Keep people away. Avoid contact with liquid, vapor, or dust.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>		
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE OR WHEN HEATED. Wear goggles and self-contained breathing apparatus.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to skin and eyes. If inhaled, may cause sneezing, nasal discharge, and nasal stuffiness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed may cause nausea, vomiting, headache, and other CNS disturbances. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Pump; Dredge Chemical and Physical Treatment: Absorb	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> Not listed. <b>2.2 Formula:</b> C <sub>21</sub> H <sub>28</sub> O <sub>5</sub> - Pyrethrin I C <sub>22</sub> H <sub>28</sub> O <sub>5</sub> - Pyrethrin II C <sub>22</sub> H <sub>28</sub> O <sub>5</sub> - Cinerin I C <sub>21</sub> H <sub>28</sub> O <sub>5</sub> - Cinerin II <b>2.3 IMO/UN Designation:</b> 6.1/9184 (>5%); 9/9184 (<5%) <b>2.4 DOT ID No.:</b> Not listed. <b>2.5 CAS Registry No.:</b> 8003-73-7 <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 59110
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Protective clothing and filter mask recommended. <b>3.2 Symptoms Following Exposure:</b> INHALATION: Sneezing, serous nasal discharge, nasal stuffiness. A few cases of extrinsic asthma have been reported. Rare: anaphylactic reaction, peripheral vascular collapse and respiratory difficulty. EYES: May be irritating. SKIN: Contact dermatitis - a mild erythematous, vesicular dermatitis with papules in moist areas and intense pruritis. INGESTION: Excitation - to convulsions - to tetanic paralysis; muscular fibrillations; death from respiratory failure. <b>3.3 Treatment of Exposure:</b> Call a doctor. INHALATION: Symptomatic - antihistamines are of value. EYES: Flush with water. SKIN: Wash with soap and water. INGESTION: Gastric lavage followed by saline catharsis. For nervous manifestations pentobarbital should be used. Diarrhea can be controlled with atropine sulfate. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg. <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> May cause hypersensitive reaction, especially following previous sensitizing exposure. May cause eczematous dermatitis. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Currently not available <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:**  
Not flammable
- 4.2 Flammable Limits in Air:** Not flammable
- 4.3 Fire Extinguishing Agents:** Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 Special Hazards of Combustion Products:** Highly toxic fumes are imminent.
- 4.6 Behavior in Fire:** Currently not available
- 4.7 Auto Ignition Temperature:** Not flammable
- 4.8 Electrical Hazards:** Not pertinent
- 4.9 Burning Rate:** Not flammable
- 4.10 Adiabatic Flame Temperature:** Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 Flame Temperature:** Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction
- 5.2 Reactivity with Common Materials:**  
Currently not available
- 5.3 Stability During Transport:** Unstable in the presence of light, moisture and air.
- 5.4 Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 Polymerization:** Currently not available
- 5.6 Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
24-hour LC<sub>50</sub> Rainbow trout = 0.56 ppm  
24-hour LC<sub>50</sub> Bluegills = 0.078 ppm  
24-hour LC<sub>50</sub> Mosquito fish = 0.027 ppm  
24-hour LC<sub>50</sub> Mosquito fish = 93 ppm  
96-hour LC<sub>50</sub> Bluegills = 74 ppm  
96-hour LC<sub>50</sub> Channel catfish = 80 ppm  
96-hour LC<sub>50</sub> Rainbow trout = 54 ppm
- 6.2 Waterfowl Toxicity:** Oral LD<sub>50</sub> Young mallards = >10,000 mg/kg
- 6.3 Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 Food Chain Concentration Potential:**  
None
- 6.5 GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Currently not available
- 7.2 Storage Temperature:** Cool
- 7.3 Inert Atmosphere:** Currently not available
- 7.4 Venting:** Currently not available
- 7.5 IMO Pollution Category:** Currently not available
- 7.6 Ship Type:** Currently not available
- 7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed
- 8.2 49 CFR Class:** Not pertinent
- 8.3 49 CFR Package Group:** Not listed.
- 8.4 Marine Pollutant:** No
- 8.5 NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity:** 1 pound
- 8.7 EPA Pollution Category:** X
- 8.8 RCRA Waste Number:** Not listed
- 8.9 EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid
- 9.2 Molecular Weight:** 328.4 Pyrethrin I; 372.4 Pyrethrin II; 316.4 Cinerin I; 360.4 Cinerin II
- 9.3 Boiling Point at 1 atm:** 338°F = 170°C = 443.2°K (Pyrethrin I) 392°F = 200°C = 473.2°K (Pyrethrin II) 279°F = 137°C = 410.2°K (Cinerin I) 361°F = 183°C = 456.2°K (Cinerin II)
- 9.4 Freezing Point:** Currently not available
- 9.5 Critical Temperature:** Currently not available
- 9.6 Critical Pressure:** Currently not available
- 9.7 Specific Gravity:** Currently not available
- 9.8 Liquid Surface Tension:** Currently not available
- 9.9 Liquid Water Interfacial Tension:** Currently not available
- 9.10 Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 Latent Heat of Vaporization:** Currently not available
- 9.13 Heat of Combustion:** Currently not available
- 9.14 Heat of Decomposition:** Currently not available
- 9.15 Heat of Solution:** Currently not available
- 9.16 Heat of Polymerization:** Currently not available
- 9.17 Heat of Fusion:** Currently not available
- 9.18 Limiting Value:** Currently not available
- 9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# PYRETHRINS

PRR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E



# PENTANE

PTA

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Liquid                      Colorless                      Gasoline odor

Floats on water. Flammable vapor is produced. Boiling point is 97°F.

Evacuate.  
Keep people away.  
Shut off ignition sources and call fire department.  
Stay upwind and use water spray to "knock down" vapor.  
Avoid contact with liquid and vapor.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

FLAMMABLE.  
Flashback along vapor trail may occur.  
Containers may explode when heated.  
Vapor may explode if ignited in an enclosed area.  
Extinguish with foam, dry chemical or carbon dioxide.  
Water may be ineffective on fire.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.  
  
VAPOR  
If inhaled, will cause dizziness or difficult breathing.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.  
  
LIQUID  
Harmful if swallowed.  
IF SWALLOWED and victim is CONSCIOUS, have victim drinkwater or milk.  
DO NOT INDUCE VOMITING.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 31; Paraffin  
2.2 Formula:  $n\text{-C}_5\text{H}_{12}$   
2.3 IMO/UN Designation: 3.1/1265  
2.4 DOT ID No.: 1265  
2.5 CAS Registry No.: 109-66-0  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51114

## 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield (as for gasoline).  
3.2 Symptoms Following Exposure: Low toxicity. Very high vapor concentrations produce narcosis. Aspiration into lungs can produce chemical pneumonitis and/or pulmonary edema.  
3.3 Treatment of Exposure: INHALATION: remove from exposure; support respiration if needed. INGESTION: do NOT induce vomiting; call physician.  
3.4 TLV-TWA: 600 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat.  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
3.12 Odor Threshold: 10 ppm  
3.13 IDLH Value: 1,500 ppm  
3.14 OSHA PEL-TWA: 1,000 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

4.1 Flash Point: -57°F C.C.  
4.2 Flammable Limits in Air: 1.4-8.3% (by vol.)  
4.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Containers may explode  
4.7 Auto Ignition Temperature: 500°F  
4.8 Electrical Hazards: Class I, Group D  
4.9 Burning Rate: 8.6 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 38.1 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 11.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC):  $\text{N}_2$  diluent: 12.0%;  $\text{CO}_2$  diluent: 14.5%

## 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

6.1 Aquatic Toxicity: >80 ppm\*/toxic/lethal/fresh water  
\*Time period not specified  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

7.1 Grades of Purity: Pure (99.2%); technical; research (99.98%)  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester) or pressure-vacuum  
7.5 IMO Pollution Category: (C)  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 72.15  
9.3 Boiling Point at 1 atm: 97.0°F = 36.1°C = 309.3°K  
9.4 Freezing Point: -201.0°F = 129.4°C = 143.8°K  
9.5 Critical Temperature: 385.7°F = 196.5°C = 469.7°K  
9.6 Critical Pressure: 490 psia = 33.3 atm = 3.37 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.626 at 20°C (liquid)  
9.8 Liquid Surface Tension: 16 dynes/cm = 0.016 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: 50.2 dynes/cm = 0.0502 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: 2.5  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.075  
9.12 Latent Heat of Vaporization: 153.7 Btu/lb = 85.38 cal/g = 3.575 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: -19,352 Btu/lb = -10,751 cal/g = -450.12 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 27.89 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 15.5 psia

## NOTES

# PENTANE

PTA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-20	41.980	15	0.526	0	0.870	-20	0.377
-15	41.810	20	0.529	10	0.860	-15	0.365
-10	41.650	25	0.532	20	0.850	-10	0.354
-5	41.480	30	0.535	30	0.840	-5	0.344
0	41.320	35	0.538	40	0.831	0	0.333
5	41.150	40	0.541	50	0.821	5	0.324
10	40.990	45	0.544	60	0.811	10	0.315
15	40.820	50	0.547	70	0.801	15	0.306
20	40.660	55	0.549	80	0.791	20	0.298
25	40.490	60	0.552	90	0.781	25	0.290
30	40.330	65	0.555			30	0.283
35	40.160	70	0.558			35	0.275
40	40.000	75	0.561			40	0.269
45	39.830	80	0.564			45	0.262
50	39.670	85	0.567			50	0.256
55	39.510	90	0.570			55	0.250
60	39.340	95	0.573			60	0.244
65	39.180					65	0.239
70	39.010					70	0.233
75	38.850					75	0.228

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	35	3.822	35	0.05193	0	0.351
	N	40	4.323	40	0.05815	25	0.366
	S	45	4.876	45	0.06494	50	0.382
	O	50	5.485	50	0.07233	75	0.397
	L	55	6.153	55	0.08036	100	0.412
	U	60	6.885	60	0.08905	125	0.427
	B	65	7.685	65	0.09845	150	0.442
	L	70	8.557	70	0.10860	175	0.457
	E	75	9.505	75	0.11950	200	0.471
		80	10.540	80	0.13120	225	0.486
		85	11.650	85	0.14380	250	0.500
		90	12.860	90	0.15720	275	0.514
		95	14.160	95	0.17160	300	0.528
		100	15.570	100	0.18690	325	0.541
		105	17.080	105	0.20330	350	0.555
		110	18.700	110	0.22060	375	0.568
		115	20.440	115	0.23900	400	0.582
		120	22.300	120	0.25860	425	0.595
						450	0.608
						475	0.620
						500	0.633
						525	0.645
						550	0.658
						575	0.670
						600	0.682

# PENTABORANE

PTB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> (9)-Pentaboron nonahydride	Liquid  Colorless  Strong sour milk odor  Ignites when exposed to air. Floats on water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Evacuate. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Evacuate area in case of large discharge. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	IGNITES WHEN EXPOSED TO AIR. Water may be ineffective on fire. DO NOT USE WATER OR FOAM ON FIRE. DO NOT USE WATER ON ADJACENT FIRES.
<b>Exposure</b>	CALL FOR MEDICAL AID. HAZARD IS FROM PRODUCTS OF COMBUSTION.  VAPOR POISONOUS IF INHALED. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: B<sub>5</sub>H<sub>9</sub>  
2.3 IMO/UN Designation: 4.2/1380  
2.4 DOT ID No.: 1380  
2.5 CAS Registry No.: 19624-22-7  
2.6 NAERG Guide No.: 135  
2.7 Standard Industrial Trade Classification: 52495

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus or air-line mask; goggles or face shield; rubber gloves and protective clothing
- 3.2 **Symptoms Following Exposure:** Inhalation of low concentrations causes dizziness, blurred vision, nausea, fatigue, light headedness or nervousness; higher concentrations also cause abnormal muscular contractions or twitching of any part of the body, difficult breathing, poor muscular coordination, imperfect articulation of speech, convulsions, and (rarely) coma. Contact with liquid causes severe irritation of eyes and irritation of skin (acute local inflammation with the formation of small blisters, redness and swelling). Can be absorbed through the skin. Compound cannot be swallowed, because it is spontaneously flammable in air.
- 3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove victim to fresh air; watch for delayed symptoms for 1-2 days. EYES: wash with copious quantities of water for at least 30 min., holding eyelids apart to insure thorough flushing. SKIN: wash immediately with soap and water; rinse affected area with a 3% ammonia solution followed by additional flushing with water.
- 3.4 TLV-TWA: 0.005 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 0.015 ppm  
3.7 Toxicity by Ingestion: Grade 4; LD<sub>50</sub> <50 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: 0.8 ppm  
3.13 IDLH Value: 1 ppm.  
3.14 OSHA PEL-TWA: 0.005 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (ignites spontaneously in air)
- 4.2 **Flammable Limits in Air:** 0.42%-98%
- 4.3 **Fire Extinguishing Agents:** Preferably shut off leak and let fire burn; extinguish with dry chemical or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Halogenated hydrocarbons, water
- 4.5 **Special Hazards of Combustion Products:** Toxic fumes may be formed.
- 4.6 **Behavior in Fire:** Tends to reignite. Contact with water applied to adjacent fires produces flammable hydrogen gas.
- 4.7 **Auto Ignition Temperature:**  
Spontaneously flammable if impure. Approx. 35°C when pure.
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly to form flammable hydrogen gas. Reaction is not hazardous unless water is hot or unless confined.
- 5.2 **Reactivity with Common Materials:**  
Corrosive to natural rubber, some synthetic rubber some greases and some lubricants
- 5.3 **Stability During Transport:** Stable below 302°F
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; 95+%; Hi-Purity: 99+%
- 7.2 **Storage Temperature:** Cool ambient
- 7.3 **Inert Atmosphere:** Inerted with dry nitrogen
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Spontaneously Combustible
- 8.2 **49 CFR Class:** 4.2
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 4              |
| Instability (Yellow)..... | 2              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 63.2
- 9.3 **Boiling Point at 1 atm:** 137.1°F = 58.4°C = 331.5°K
- 9.4 **Freezing Point:** -52.2°F = -46.8°C = 224.6°K
- 9.5 **Critical Temperature:** 440.6°F = 227°C = 500.2°K
- 9.6 **Critical Pressure:** 570 psia = 38 atm = 3.9 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.623 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 20.8 dynes/cm = 0.0208 N/m at 25°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 2.2
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0399
- 9.12 **Latent Heat of Vaporization:** 219 Btu/lb = 122 cal/g = 5.10 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -29,100 Btu/lb = -16,200 cal/g = -677 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PENTABORANE

PTB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	39.920	-20	0.488	-20	1.071	35	0.398
40	39.770	-15	0.492	-15	1.066	40	0.385
45	39.620	-10	0.496	-10	1.062	45	0.372
50	39.460	-5	0.500	-5	1.057	50	0.361
55	39.310	0	0.504	0	1.053	55	0.350
60	39.160	5	0.508	5	1.048	60	0.339
65	39.010	10	0.513	10	1.044	65	0.329
70	38.850	15	0.517	15	1.039	70	0.319
75	38.700	20	0.521	20	1.035	75	0.310
80	38.550	25	0.525	25	1.030	80	0.301
85	38.400	30	0.529	30	1.026	85	0.293
90	38.240	35	0.533	35	1.021	90	0.285
95	38.090	40	0.538	40	1.017	95	0.278
100	37.940	45	0.542	45	1.012	100	0.270
		50	0.546	50	1.008	105	0.263
		55	0.550	55	1.003	110	0.257
		60	0.554	60	0.999	115	0.250
		65	0.558	65	0.994	120	0.244
		70	0.563	70	0.990		
		75	0.567	75	0.985		
		80	0.571				
		85	0.575				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	55	1.812	55	0.02072	90	0.838
	N	60	2.063	60	0.02338	100	0.846
	S	65	2.344	65	0.02630	110	0.855
	O	70	2.657	70	0.02953	120	0.864
	L	75	3.004	75	0.03308	130	0.873
	U	80	3.389	80	0.03697	140	0.882
	B	85	3.815	85	0.04123	150	0.890
	L	90	4.285	90	0.04589	160	0.899
	E	95	4.802	95	0.05097	170	0.908
		100	5.372	100	0.05651	180	0.917
		105	5.997	105	0.06253	190	0.925
		110	6.682	110	0.06906	200	0.934
		115	7.431	115	0.07613	210	0.943
	R	120	8.249	120	0.08378	220	0.952
	E	125	9.140	125	0.09204	230	0.961
	A	130	10.110	130	0.10100	240	0.969
	C	135	11.170	135	0.11050	250	0.978
	T	140	12.310	140	0.12090	260	0.987
	S	145	13.550	145	0.13190		
		150	14.890	150	0.14380		
		155	16.340	155	0.15650		

# POTASSIUM CYANIDE

PTC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cyanide	Solid crystals White Almond odor  Sinks and mixes with water.
Keep people away. AVOID CONTACT WITH SOLID, DUST AND WATER SOLUTION. Wear chemical protective suit with self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: KCN  
2.3 IMO/UN Designation: 6.1/1680  
2.4 DOT ID No.: 1680  
2.5 CAS Registry No.: 151-50-8  
2.6 NAERG Guide No.: 157  
2.7 Standard Industrial Trade Classification: 52381

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear dry cotton gloves and U.S. Bureau of Mines approved dust respirator when handling solid potassium cyanide. Wear rubber gloves and approved chemical safety goggles when handling solutions.
- 3.2 **Symptoms Following Exposure:** Is a rapidly fatal poison when taken into the digestive system. Dust may cause toxic symptoms when inhaled, and prolonged contact with the skin may cause irritation and possibly poisoning if skin is broken. Strong solutions are corrosive to skin and may cause deep ulcers that heal slowly.
- 3.3 **Treatment of Exposure:** INGESTION: call physician immediately; have victim lie down and keep him quiet and warm. If he is CONSCIOUS, induce vomiting by having him drink warm salt water (1 tablespoon per cup of water); repeat until vomit fluid is clear; then give orally 1 pint of 1% solution of sodium thiosulfate, to be repeated in 15 min. If victim is NOT BREATHING, give artificial respiration until breathing starts. If victim is UNCONSCIOUS BUT BREATHING, give oxygen from an inhalator if he does not respond to treatment. In all cases, break an amyl nitrite pearl\* in a cloth and hold lightly under victim's nose for 15 sec., repeating 5 times at about 15-sec. intervals; if necessary, repeat procedure every 3 min. with fresh pearls until 3 or 4 have been used. \*Amyl nitrite pearls must not be over 2 years old. Avoid breathing the vapor while administering it to the victim.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 5 mg/m<sup>3</sup>  
3.7 Toxicity by Ingestion: Grade 4; LD<sub>50</sub> below 50 mg/kg (mice)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Non-volatile, but moisture in air can liberate some lethal hydrogen cyanide gas.  
3.11 Liquid or Solid Characteristics: Moist solid can cause caustic-type irritation of skin and formation of ulcers.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 25 mg/m<sup>3</sup> (as cyanide)  
3.14 OSHA PEL-TWA: 5 mg/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Not flammable  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not flammable  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: When potassium cyanide dissolves in water, a mild reaction occurs and some poisonous hydrogen cyanide gas is released. This gas is not hazardous except in an enclosed space. If the water is acidic, however, toxic amounts of the gas will form at once.  
5.2 Reactivity with Common Materials: Contact with even weak acids causes formation of deadly hydrogen cyanide gas.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 0.16 ppm/48 hr/bluegill/TL<sub>50</sub>/fresh water  
0.49 ppm/48 hr/adult zebrafish/TL<sub>50</sub>/salt water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 0% of theoretical in 7 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99.0%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Sealed containers must be stored in a well-ventilated area.  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: P098  
8.9 EPA FWPCL List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 65.12  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: 1174.1°F = 634.5°C = 907.7°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.52 at 16°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 53.7 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# POTASSIUM CYANIDE

PTC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	71.599		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# POTASSIUM DICHROMATE

PTD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bichrome Potassium bichromate	Solid crystals Red to orange Odorless
Sinks and mixes with water.	
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose, and throat. If inhaled, will cause difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLIDS Will burn skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Collection Systems: Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $K_2Cr_2O_7$ 2.3 IMO/UN Designation: 9.0/1874 2.4 DOT ID No.: 1479 2.5 CAS Registry No.: 7778-50-9 2.6 NAERG Guide No.: 140 2.7 Standard Industrial Trade Classification: 52389
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Approved dust mask; protective gloves; goggles or face shield. 3.2 <b>Symptoms Following Exposure:</b> Highly corrosive to skin and mucous membranes. If ingested, causes violent gastroenteritis, peripheral vascular collapse, vertigo, muscle cramps, coma, and (later) toxic nephritis with glycosuria. Allergic reactions may also occur. 3.3 <b>Treatment of Exposure:</b> INGESTION: have victim drink water or milk; do NOT induce vomiting. SKIN: treat like acid burns; external lesions may be scrubbed with 2% solution of sodium thiosulfate. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; LD <sub>50</sub> to 500 mg/kg (human) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Some suggestion of lung cancer. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Dusts or mists may cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 3.11 <b>Liquid or Solid Characteristics:</b> Severe skin irritant; causes second-and third-degree burns on short contact and is very injurious to the eyes. 3.12 <b>Odor Threshold:</b> Odorless 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Flood spill area with water.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** May decompose, generating oxygen. Supports the combustion of other materials.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Ignition may occur when in contact with finely divided combustibles, such as sawdust.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
739 ppm/24 hr/bluegill/TL<sub>50</sub>/fresh water  
17.8 ppm\*/silver salmon/toxic/salt water  
\*Time period not specified.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.9%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** Currently not available.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 294.19
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** 748°F = 398°C = 671°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.676 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 29.8 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# POTASSIUM DICHROMATE

PTD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	5.094		N O T		N O T		N O T
36	5.594						
38	6.094						
40	6.594						
42	7.094						
44	7.594		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
46	8.094						
48	8.594						
50	9.094						
52	9.594						
54	10.090						
56	10.590						
58	11.090						
60	11.590						
62	12.090						
64	12.590						
66	13.090						
68	13.590						
70	14.090						
72	14.590						
74	15.090						
76	15.590						
78	16.090						
80	16.590						
82	17.090						
84	17.590						



# 1-PENTENE

PTE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> alpha-n-Amylene Propylethylene	Liquid Colorless Gasoline odor  Floats on water. Flammable vapor is produced. Boiling point is 86°F.
Evacuate. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Containers may explode when heated. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR If inhaled, will cause dizziness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_3\text{CH}=\text{CH}_2$   
2.3 IMO/UN Designation: 3.1/1108  
2.4 DOT ID No.: 1108  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield (as for gasoline).  
3.2 **Symptoms Following Exposure:** Acts as a simple asphyxiant or weak anesthetic in high vapor concentrations. Similar to effects caused by gasoline vapors.  
3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure. SKIN: wash with soap and water. EYES: flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Not irritating  
3.11 **Liquid or Solid Characteristics:** Not irritating  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
-60°F C.C.; 0°F O.C.  
4.2 **Flammable Limits in Air:** 1.4%-8.7%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide. Stop flow of vapor.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Containers may explode in fire.  
4.7 **Auto Ignition Temperature:** 527°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 9.1 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
655 ppm/1 hr/sunfish/lethal/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0.8% (theor.), 0.5 day; 0.5% (theor.), 1 day  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: (1)  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Research: 99.9%; pure: 99.4%; technical: 97.0%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 70.13  
9.3 **Boiling Point at 1 atm:** 85.8°F = 29.9°C = 303.1°K  
9.4 **Freezing Point:** -265°F = -165°C = 108°K  
9.5 **Critical Temperature:** 376.9°F = 191.6°C = 464.8°K  
9.6 **Critical Pressure:** 588 psia = 40 atm = 4.05 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.641 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 16.5 dynes/cm = 0.0165 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 2.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.083  
9.12 **Latent Heat of Vaporization:** 154.6 Btu/lb = 85.87 cal/g = 3.595 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -19,359 Btu/lb = -10,755 cal/g = -450.29 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1-PENTENE

PTE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
15	41.850	0	0.493	15	0.943	-35	0.356
20	41.680	10	0.498	20	0.934	-30	0.344
25	41.500	20	0.502	25	0.924	-25	0.332
30	41.330	30	0.507	30	0.915	-20	0.322
35	41.160	40	0.512	35	0.905	-15	0.311
40	40.980	50	0.516	40	0.896	-10	0.302
45	40.810	60	0.521	45	0.887	-5	0.293
50	40.640	70	0.525	50	0.877	0	0.284
55	40.460	80	0.530	55	0.868	5	0.276
60	40.290			60	0.858	10	0.268
65	40.120			65	0.849	15	0.260
70	39.940			70	0.840	20	0.253
75	39.770			75	0.830	25	0.246
				80	0.821	30	0.240
				85	0.811	35	0.234
						40	0.228
						45	0.222
						50	0.217
						55	0.212
						60	0.207
						65	0.202

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		-70	0.167	-70	0.00280	0	0.330
		-60	0.253	-60	0.00414	25	0.344
		-50	0.374	-50	0.00596	50	0.358
		-40	0.540	-40	0.00841	75	0.372
		-30	0.764	-30	0.01162	100	0.386
		-20	1.061	-20	0.01577	125	0.400
		-10	1.448	-10	0.02104	150	0.413
		0	1.945	0	0.02764	175	0.427
		10	2.573	10	0.03579	200	0.440
		20	3.359	20	0.04574	225	0.453
		30	4.328	30	0.05774	250	0.466
		40	5.512	40	0.07206	275	0.479
		50	6.942	50	0.08898	300	0.491
		60	8.654	60	0.10880	325	0.504
		70	10.680	70	0.13180	350	0.516
		80	13.070	80	0.15830	375	0.528
		90	15.860	90	0.18850	400	0.540
		100	19.090	100	0.22290	425	0.551
		110	22.820	110	0.26160	450	0.563
		120	27.070	120	0.30510	475	0.574
		130	31.910	130	0.35350	500	0.585
		140	37.370	140	0.40720	525	0.596
		150	43.520	150	0.46640	550	0.607
		160	50.400	160	0.53140	575	0.618
		170	58.060	170	0.60240	600	0.628

# POTASSIUM HYDROXIDE

PTH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Caustic potash Lye	Solid crystals, or watery liquid  White solid or colorless liquid  Odorless  Solid sinks and mixes slowly with water. Liquid mixes with water.
<b>Keep people away.</b> <b>Avoid contact with liquid, solid, vapor, and dust.</b> <b>Wear rubber overclothing (including gloves).</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Not flammable. Flammable gas may be produced on contact with metals. May cause fire on contact with moisture and combustibles. Wear rubber overclothing (including gloves). Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST OR MIST Irritating to eyes, nose, and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. IF IN EYES, hold eyelids open and flush with plenty of water.  SOLID OR LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing or shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 5; Caustics
- 2.2 Formula: KOH
- 2.3 IMO/UN Designation: 8.0/1814
- 2.4 DOT ID No.: 1813
- 2.5 CAS Registry No.: 1310-58-3
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52264

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wide-brimmed hat and close-fitting safety goggles with rubber side shields; respirator for dust; long-sleeved cotton shirt or jacket with buttoned collar and buttoned sleeves; rubber or rubber-coated canvas gloves (shirt sleeves should be buttoned over the gloves); rubber shoes or boots; cotton coveralls (with trouser cuffs worn over boots); rubber apron.
- 3.2 **Symptoms Following Exposure:** Causes severe burns of eyes, skin, and mucous membranes.
- 3.3 **Treatment of Exposure:** (Act quickly!) Call a physician at once, even when injury seems to be slight.  
INGESTION: give water and milk; do NOT induce vomiting. EYES: flush with water at once for at least 15 min. SKIN: flush with water, then rinse with dilute vinegar.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 2 mg/m<sup>3</sup>
- 3.7 **Toxicity by Ingestion:** Grade 3; oral rat LD<sub>50</sub> = 364 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact; and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves with liberation of much heat; may steam and spatter.
- 5.2 **Reactivity with Common Materials:**  
When wet, attacks metals such as aluminum, tin, lead, and zinc to produce flammable hydrogen gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute acetic acid.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
80 ppm/24 hr/mosquito fish/TL<sub>w</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical flake: 85-90%; USP pellets: 85-90%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	1
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 56.11
- 9.3 **Boiling Point at 1 atm:** Very high
- 9.4 **Freezing Point:** 716°F = 380°C = 653°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.04 at 15°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 35.3 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# POTASSIUM HYDROXIDE

PTH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	98.070		N		N		N
36	99.139		O		O		O
38	100.200		T		T		T
40	101.299						
42	102.400		P		P		P
44	103.500		E		E		E
46	104.500		R		R		R
48	105.599		T		T		T
50	106.700		I		I		I
52	107.799		N		N		N
54	108.799		E		E		E
56	109.900		N		N		N
58	111.000		E		E		E
60	112.099		N		N		N
62	113.200		T		T		T
64	114.200						
66	115.299						
68	116.400						
70	117.500						
72	118.500						
74	119.599						
76	120.700						
78	121.799						
80	122.900						
82	123.900						
84	125.000						

# POTASSIUM IODIDE

PTI

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid crystals      White      Odorless

Sinks and mixes with water.

Keep people away.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.

#### SOLID

Harmful if swallowed.

Flush affected areas with plenty of water.

IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.

May be dangerous if it enters water intakes.

Notify local health and wildlife officials.

Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: KI  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 7681-11-0  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 52329

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield.  
3.2 Symptoms Following Exposure: May irritate eyes or open cuts.  
3.3 Treatment of Exposure: Flush all affected areas with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (human)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Non-volatile  
3.11 Liquid or Solid Characteristics: None  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Not flammable  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not flammable  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Corrosive in all concentrations to most metals, except stainless steel, titanium, and tantalum.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 7.5 ppm\*/daphnia/toxic/fresh water  
\*Time period not specified.  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: USP, ACS, CP (all 99+%)  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 166.01  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: 1258°F = 681°C = 954°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 3.13 at 15°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 24.7 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# POTASSIUM IODIDE

PTI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	128.400		N		N		N
36	129.299		O		O		O
38	130.199		T		T		T
40	131.099						
42	132.000		P		P		P
44	133.000		E		E		E
46	133.900		R		R		R
48	134.799		T		T		T
50	135.699		I		I		I
52	136.599		N		N		N
54	137.500		E		E		E
56	138.400		N		N		N
58	139.299		E		E		E
60	140.199		N		N		N
62	141.199		T		T		T
64	142.099						
66	143.000						
68	143.900						
70	144.799						
72	145.699						
74	146.599						
76	147.500						
78	148.400						
80	149.400						
82	150.299						
84	151.199						

# PETROLATUM

PTL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Petrolatum jelly Petroleum jelly Vaseline Yellow petrolatum	Thick liquid  Dark brown, green, amber or white  Odorless  Floats on water.
<b>Keep people away. Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous Hydrocarbon Mixtures  
2.2 **Formula:** Not applicable  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:**  
33510

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield  
3.2 **Symptoms Following Exposure:** None  
3.3 **Treatment of Exposure:** EYES: wash with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** None  
3.11 **Liquid or Solid Characteristics:** None  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
360–430°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** USP, NF, technical (these vary in color and in melting point)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Grease  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Very high  
9.4 **Freezing Point:** 100–135°F = 38–57°C = 311–330°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) 0.865 at 60°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** 35–50 dynes/cm = 0.035–0.050 N/m  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** 97–100 Btu/lb = 54–63 cal/g = 2.3–2.6 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Very low

### NOTES

# PETROLATUM

PTL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
136	53.060	135	0.478	130	0.804	212	8.600
138	53.060	136	0.478	140	0.804		
140	53.060	137	0.478	150	0.804		
142	53.060	138	0.478	160	0.804		
144	53.060	139	0.478	170	0.804		
146	53.060	140	0.478	180	0.804		
148	53.060	141	0.478	190	0.804		
150	53.060	142	0.478	200	0.804		
152	53.060	143	0.478	210	0.804		
154	53.060	144	0.478	220	0.804		
156	53.060	145	0.478	230	0.804		
158	53.060	146	0.478	240	0.804		
160	53.060	147	0.478	250	0.804		
162	53.060	148	0.478	260	0.804		
164	53.060	149	0.478	270	0.804		
166	53.060	150	0.478	280	0.804		
168	53.060	151	0.478	290	0.804		
170	53.060	152	0.478	300	0.804		
172	53.060						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T



# POTASSIUM

PTM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Potassium oxalate	Solid  Silver-white  Odorless  Reacts violently with water. Flammable gas is produced.
<b>Keep people away. Avoid contact with solid. Evacuate.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. IGNITES WHEN EXPOSED TO WATER OR MOISTURE. Flammable gas is produced on contact with water. Extinguish with dry graphite, soda ash, or other inert powder. DO NOT USE WATER OR FOAM ON FIRE. DO NOT USE WATER OR FOAM ON ADJACENT FIRES.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Will burn skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: K  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2257  
2.5 CAS Registry No.: 7440-09-7  
2.6 NAERG Guide No.: 138  
2.7 Standard Industrial Trade Classification: 52228

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Contact with eyes or skin causes severe burns.  
3.3 **Treatment of Exposure:** EYES or SKIN: flush with water; treat caustic burns.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Not pertinent  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Graphite, sand, sodium chloride  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam, carbon dioxide, or halogenated hydrocarbons  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Reacts violently with water, forming flammable and explosive hydrogen gas. May ignite spontaneously in air.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 2.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 1.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 99.9+% (Shipped under oil)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Inerted  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Dangerous When Wet  
8.2 **49 CFR Class:** 4.3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	2
Special (White).....	W

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently to form flammable hydrogen gas and a strong caustic solution.  
5.2 **Reactivity with Common Materials:** May ignite combustible materials if they are damp  
5.3 **Stability During Transport:** Stable, if protected from air and moisture  
5.4 **Neutralizing Agents for Acids and Caustics:** Caustic formed by reaction with water should be flushed with water, then area can be rinsed with dilute acetic acid.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
80 ppm/24 hr/mosquito fish/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 39  
9.3 **Boiling Point at 1 atm:** 1,425°F = 774°C = 1,047°K  
9.4 **Freezing Point:** 145°F = 63°C = 336°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.86 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -2,003 Btu/lb = -1,113 cal/g = -46.57 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -2,104 Btu/lb = -1,169 cal/g = -48.91 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 14.6 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# POTASSIUM

PTM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# PETROLEUM NAPHTHA

PTN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Petroleum solvent	Liquid                      Colorless                      Gasoline odor  Floats on water. Flammable vapor is produced.
Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with foam, dry chemical, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Not irritating to eyes, nose, or throat.  LIQUID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment: Burn;  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 33;  
 2.2 **Miscellaneous Hydrocarbon Mixtures**  
 2.3 **Formula:** Not applicable  
 2.4 **IMO/UN Designation:** 3.2/1255  
 2.5 **DOT ID No.:** 1268  
 2.6 **CAS Registry No.:** 8030-30-6  
 2.7 **NAERG Guide No.:** 128  
 2.8 **Standard Industrial Trade Classification:** 33429

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield (as for gasoline).  
 3.2 **Symptoms Following Exposure:** Inhalation of concentrated vapor may cause intoxication. Liquid is not very irritating to skin or eyes but may get into lungs by aspiration.  
 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air and treat symptoms. INGESTION: have victim drink water or milk; do NOT induce vomiting. EYES: flush with water for 15 min. SKIN: wipe off and wash with soap and water.  
 3.4 **TLV-TWA:** 400 ppm  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** None  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to the eyes and throat.  
 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** 1,000 ppm  
 3.14 **OSHA PEL-TWA:** 100 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 20°F (approx.) C.C.  
 4.2 **Flammable Limits in Air:** 0.9%-6.0%  
 4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 450°F (approx.)  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 4 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Currently not available  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** Not pertinent  
 9.3 **Boiling Point at 1 atm:** 207.0°F = 97.2°C = 370.4°K  
 9.4 **Freezing Point:** Not pertinent  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.74 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 19–23 dynes/cm = 0.019–0.023 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** 39–51 dynes/cm = 0.039–0.051 N/m at 20°C  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.030  
 9.12 **Latent Heat of Vaporization:** 130–150 Btu/lb = 71–81 cal/g = 3.0–3.4 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** Currently not available  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PETROLEUM NAPHTHA

PTN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	46.750	10	0.456	50	1.040	50	9.343
54	46.680	15	0.459	52	1.040	52	8.841
56	46.610	20	0.461	54	1.040	54	8.370
58	46.540	25	0.464	56	1.040	56	7.927
60	46.470	30	0.467	58	1.040	58	7.511
62	46.400	35	0.469	60	1.040	60	7.119
64	46.330	40	0.472	62	1.040	62	6.751
66	46.260	45	0.474	64	1.040	64	6.404
68	46.190	50	0.477	66	1.040	66	6.078
70	46.120	55	0.480	68	1.040	68	5.770
72	46.050	60	0.482	70	1.040	70	5.481
74	45.980	65	0.485	72	1.040	72	5.207
76	45.920	70	0.488	74	1.040	74	4.950
78	45.850	75	0.490	76	1.040	76	4.707
80	45.780	80	0.493	78	1.040	78	4.477
82	45.710	85	0.495	80	1.040	80	4.260
84	45.640	90	0.498	82	1.040	82	4.056
86	45.570	95	0.501	84	1.040	84	3.862
		100	0.503	86	1.040	86	3.679
		105	0.506	88	1.040	88	3.506
				90	1.040	90	3.342
				92	1.040	92	3.187
				94	1.040	94	3.040
				96	1.040	96	2.901
				98	1.040	98	2.770
				100	1.040	100	2.645

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	90	0.094		N		N
	N	100	0.124		O		O
	S	110	0.163		T		T
	O	120	0.211				
	L	130	0.272		P		P
	U	140	0.347		E		E
	B	150	0.440		R		R
	L	160	0.553		T		T
	E	170	0.691		I		I
		180	0.856		N		N
		190	1.054		E		E
		200	1.290		N		N
		210	1.569		T		T
		220	1.897				
		230	2.281				
		240	2.728				
		250	3.247				
		260	3.846				
		270	4.535				
		280	5.323				
		290	6.221				
		300	7.241				
		310	8.394				
		320	9.695				
		330	11.160				
		340	12.790				

# PARATHION

PTO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> O,O-Diethyl O-(p-nitrophenyl) phosphorothioate Ethyl parathion Phosphorothioic acid, O,O-diethyl-O-p-Nitrophenyl ester		Liquid  Light to dark brown  Sinks in water. Freezing point is 43°F.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (C<sub>2</sub>H<sub>5</sub>O)<sub>2</sub>PSOC<sub>6</sub>H<sub>4</sub>NO<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/2784  
2.4 DOT ID No.: 2783  
2.5 CAS Registry No.: 56-38-2  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification: 51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Neoprene-coated gloves; rubber work shoes or overshoes; latex rubber apron; goggles; respirator or mask approved for toxic dusts and organic vapors
- 3.2 **Symptoms Following Exposure:** Inhalation of mist, dust, or vapor (or ingestion, or absorption through the skin) cause dizziness, usually accompanied by constriction of the pupils, headache, and tightness of the chest. Nausea, vomiting, abdominal cramps, diarrhea, muscular twitchings, convulsions and possibly death may follow. An increase in salivary and bronchial secretions may result which simulate severe pulmonary edema. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** Call a doctor for all exposures to this compound. INHALATION: remove victim from exposure immediately; have physician treat with atropine injections until full atropinization; 2-PAM may also be administered by physician. EYES: flush with water immediately after contact for at least 15 min. SKIN: remove all clothing and shoes immediately; quickly wipe off the affected area with a clean cloth; follow immediately with a shower, using plenty of soap. If a complete shower is impossible, wash the affected skin repeatedly with soap and water. INGESTION: if victim is conscious, induce vomiting and repeat until vomit fluid is clear; make victim drink plenty of milk or water; have him lie down and keep warm.
- 3.4 TLV-TWA: 0.1 mg/m<sup>3</sup> (skin)  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 4; oral LD<sub>50</sub> = 2 mg/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Birth defects in chick embryos  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: 0.04 ppm  
3.13 IDLH Value: 10 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 0.1 mg/m<sup>3</sup> (skin)  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Water on adjacent fires
- 4.4 **Fire Extinguishing Agents Not to Be Used:** High-pressure water hoses may scatter parathion from broken containers, increasing contamination hazard.
- 4.5 **Special Hazards of Combustion**  
**Products:** Fumes from decomposing material may contain oxides of sulfur and nitrogen.
- 4.6 **Behavior in Fire:** Containers may explode when heated.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Slow reaction, not considered hazardous
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.6 ppm/96 hr/minnow/TL<sub>m</sub>/fresh water  
0.43 ppm/<24 hr/shrimp/lethal/salt water
- 6.2 **Waterfowl Toxicity:** LD<sub>50</sub> = 2.13 mg/kg
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:** No buildup in food chain
- 6.5 **GESAMP Hazard Profile:**  
**Bioaccumulation:** 0  
**Damage to living resources:** 4  
**Human Oral hazard:** 4  
**Human Contact hazard:** II  
**Reduction of amenities:** XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98.5+% Sometimes distributed as solutions emulsifiable in water.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: Yes
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 2              |
- 8.6 EPA Reportable Quantity: 10 pounds
- 8.7 EPA Pollution Category: A
- 8.8 RCRA Waste Number: P089
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 291.3
- 9.3 **Boiling Point at 1 atm:** Very high; decomposes
- 9.4 **Freezing Point:** 43°F = 6°C = 279°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.269 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** -9,240 Btu/lb = -5,140 cal/g = -215 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PARATHION

PTO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
65	79.379	65	0.338	60	0.967	65	20.340
70	79.209	70	0.339	61	0.967	70	18.290
75	79.049	75	0.341	62	0.967	75	16.480
80	78.879	80	0.343	63	0.967	80	14.880
85	78.719	85	0.345	64	0.967	85	13.460
90	78.559	90	0.347	65	0.967	90	12.200
95	78.400	95	0.349	66	0.967	95	11.070
100	78.240	100	0.350	67	0.967	100	10.070
105	78.080	105	0.352	68	0.967	105	9.173
110	77.929	110	0.354	69	0.967	110	8.370
115	77.770	115	0.356	70	0.967	115	7.649
120	77.620	120	0.358	71	0.967	120	7.001
125	77.459	125	0.359	72	0.967	125	6.417
		130	0.361	73	0.967		
				74	0.967		
				75	0.967		
				76	0.967		
				77	0.967		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T		N O T		N O T
	R E A C T S  S L O W L		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T

# POTASSIUM PERMANGANATE

PTP

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid crystals      Dark purple      Odorless

Sinks and mixes slowly with water.

Keep people away.  
Avoid contact with solid and dust.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
Containers may explode in fire.  
May cause fire and explode on contact with combustibles.  
Flood discharge area with water.  
Cool exposed containers with water.

### Exposure

CALL FOR MEDICAL AID.

SOLID  
Irritating to skin and eyes.  
If swallowed, will cause nausea, vomiting, or loss of consciousness.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse dissolved material  
Stop discharge  
Collection Systems: Dredge  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{KMnO}_4$   
2.3 IMO/UN Designation: 5.1/1490  
2.4 DOT ID No.: 1490  
2.5 CAS Registry No.: 7722-64-7  
2.6 NAERG Guide No.: 140  
2.7 Standard Industrial Trade Classification: 52389

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves.  
3.2 Symptoms Following Exposure: Burns and stains the skin dark brown. If ingested will cause severe distress of gastro-intestinal system. May be fatal if over 4 oz. are consumed.  
3.3 Treatment of Exposure: INGESTION: induce vomiting and follow with thorough gastric lavage, demulcents, glucose I.V., fluid therapy, and antibiotics. Tracheostomy may be lifesaving.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3;  $\text{LD}_{50}$  = 50 to 500 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Non-volatile  
3.11 Liquid or Solid Characteristics: Can burn skin if not flushed with water.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Flood spill area with water.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: May cause fire on contact with combustibles. Containers may explode.  
4.7 Auto Ignition Temperature: Not flammable  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not flammable  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Attacks rubber and most fibers. May cause ignition of wood. Some acids, such as sulfuric acid, may cause an explosion.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 5.4 ppm/48 hr/bluegill/TL<sub>96</sub>/fresh water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: USP, Reagent (both 99+%)  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer  
8.2 49 CFR Class: 5.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0
Special (White).....	OX

  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 158.04  
9.3 Boiling Point at 1 atm: Decomposes  
9.4 Freezing Point: >464°F = >240°C = >513°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 2.70 at 15°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# POTASSIUM PERMANGANATE

PTP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	3.031		N		N		N
36	3.264		O		O		O
38	3.497		T		T		T
40	3.731						
42	3.964		P		P		P
44	4.197		E		E		E
46	4.431		R		R		R
48	4.664		T		T		T
50	4.897		I		I		I
52	5.131		N		N		N
54	5.364		E		E		E
56	5.597		N		N		N
58	5.831		T		T		T
60	6.064						
62	6.297						
64	6.531						
66	6.764						
68	6.997						
70	7.231						
72	7.464						
74	7.697						
76	7.931						
78	8.164						
80	8.397						
82	8.631						
84	8.864						



# NONENE

NON

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nonene (nonlinear) Propylene trimer Tripropylene	Liquid                      Colorless                      Gasoline-like odor  Floats on water. Flammable, irritating vapor is produced.
<p>Keep people away.  Avoid inhalation.  Shut off ignition sources and call fire department.  Stay upwind and use water spray to "knock down" vapor.  Avoid contact with liquid and vapor.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	<b>FLAMMABLE:</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause dizziness or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula: C<sub>9</sub>H<sub>18</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2057  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Respiratory organic vapor canister or air-supplied mask; face splash shield.  
3.2 **Symptoms Following Exposure:** High vapor concentrations irritate eyes and respiratory tract and act as an anesthetic.  
3.3 **Treatment of Exposure:** INHALATION: remove patient to fresh air; if breathing stops, apply artificial respiration and administer oxygen; call a physician. INGESTION: do NOT induce vomiting because of aspiration hazard.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present at high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 78°F O.C.  
4.2 **Flammable Limits in Air:** 0.7%-3.9% (est.)  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 6.0 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 64.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	3
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 126.2  
9.3 **Boiling Point at 1 atm:** 275–284°F = 135–140°C = 408–413°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.739 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 22 dynes/cm = 0.022 N/m at 24°C  
9.9 **Liquid Water Interfacial Tension:** 35.5 dynes/cm = 0.0355 N/m at 21.3°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.044  
9.12 **Latent Heat of Vaporization:** (est.) 124 Btu/lb = 68.9 cal/g = 2.88 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** –19,100 Btu/lb = –10,600 cal/g = –445 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.21 psia

### NOTES

# NONENE

NON

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
32	47.120	85	0.529	42	1.040	46	0.722
34	47.060	90	0.533	44	1.040	48	0.712
36	47.010	95	0.536	46	1.040	50	0.701
38	46.950	100	0.540	48	1.040	52	0.691
40	46.900	105	0.543	50	1.040	54	0.681
42	46.840	110	0.547	52	1.040	56	0.671
44	46.790	115	0.550	54	1.040	58	0.662
46	46.730	120	0.554	56	1.040	60	0.653
48	46.680	125	0.557	58	1.040	62	0.643
50	46.620	130	0.561	60	1.040	64	0.635
52	46.570	135	0.564	62	1.040	66	0.626
54	46.510	140	0.568	64	1.040	68	0.617
56	46.460	145	0.571	66	1.040	70	0.609
58	46.400	150	0.575	68	1.040	72	0.601
60	46.350			70	1.040	74	0.593
62	46.300			72	1.040	76	0.585
64	46.240			74	1.040	78	0.577
66	46.190			76	1.040	80	0.570
68	46.130			78	1.040	82	0.562
70	46.080			80	1.040	84	0.555
72	46.020			82	1.040	86	0.548
74	45.970			84	1.040	88	0.541
76	45.910					90	0.534
78	45.860					92	0.528
80	45.800					94	0.521
82	45.750					96	0.515

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	80	0.114	80	0.00248	0	0.335
	N	90	0.159	90	0.00340	25	0.350
	S	100	0.218	100	0.00459	50	0.364
	O	110	0.296	110	0.00610	75	0.379
	L	120	0.395	120	0.00802	100	0.393
	U	130	0.522	130	0.01040	125	0.407
	B	140	0.681	140	0.01335	150	0.421
	L	150	0.879	150	0.01695	175	0.435
	E	160	1.123	160	0.02130	200	0.448
		170	1.421	170	0.02652	225	0.462
		180	1.781	180	0.03274	250	0.475
		190	2.214	190	0.04007	275	0.488
		200	2.730	200	0.04866	300	0.501
		210	3.341	210	0.05866	325	0.514
		220	4.059	220	0.07022	350	0.526
		230	4.898	230	0.08349	375	0.538
		240	5.872	240	0.09866	400	0.551
		250	6.996	250	0.11590	425	0.563
		260	8.286	260	0.13540	450	0.574
		270	9.760	270	0.15730	475	0.586
		280	11.440	280	0.18180	500	0.597
		290	13.330	290	0.20910	525	0.609
		300	15.470	300	0.23930	550	0.620
		310	17.860	310	0.27280	575	0.631
		320	20.540	320	0.30970	600	0.642
		330	23.510	330	0.35010		

# POTASSIUM OXALATE

PTS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Potassium oxalate monohydrate	Solid  White  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $K_2C_2O_4 \cdot H_2O$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52389

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Approved dust respirator; chemical goggles; rubber or plastic-coated gloves
- 3.2 Symptoms Following Exposure: Inhalation of dust can cause systemic poisoning. Ingestion causes burning pain in throat, esophagus, and stomach; exposed areas of mucous membrane turn white; vomiting, severe purging, weak pulse, and cardiovascular collapse may result; if death is delayed, neuromuscular symptoms develop. Contact with eyes or skin causes irritation.
- 3.3 Treatment of Exposure: Act promptly! INHALATION: remove victim to fresh air; if exposure to dust is severe, get medical attention. INGESTION: call physician immediately; have victim drink dilute calcium lactate, lime water, chalk soln., or even milk; large amounts of calcium are required; administer gastric lavage with dilute lime water; watch for edema of the glottis and delayed constriction of esophagus. EYES: flush with water and seek medical attention. SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 3;  $LD_{50} = 50\text{-}500\text{ mg/kg}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Loses water at about  $160^\circ$  and decomposes to carbonate with no charring. The reaction is not hazardous.
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent, 99.0%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: Not pertinent
- 7.4 Venting: None
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at  $15^\circ\text{C}$  and 1 atm: Solid
- 9.2 Molecular Weight: 184.24
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.13 at  $18.5^\circ\text{C}$  (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# POTASSIUM OXALATE

PTS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	25.970		N		N		N
36	26.530		O		O		O
38	27.100		T		T		T
40	27.670						
42	28.230		P		P		P
44	28.800		E		E		E
46	29.370		R		R		R
48	29.930		T		T		T
50	30.500		I		I		I
52	31.070		N		N		N
54	31.630		E		E		E
56	32.200		N		N		N
58	32.770		E		E		E
60	33.330		N		N		N
62	33.900		T		T		T
64	34.470						
66	35.030						
68	35.600						
70	36.170						
72	36.730						
74	37.300						
76	37.870						
78	38.430						
80	39.000						
82	39.570						
84	40.130						

# PROPYLENE TETRAMER

PTT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dodecene (non-linear) Tetrapropylene	Liquid  Colorless  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with foam, water, dry chemical, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $C_{12}H_{24}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2850  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield.  
3.2 **Symptoms Following Exposure:** No inhalation hazard expected. Aspiration hazard if ingested. Low skin and eye irritation.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. INGESTION: do NOT lavage or induce vomiting; give vegetable oil and demulcents; call physician. EYES: flush with water for 15 min. SKIN: wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> above 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 134°F O.C. 120°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water fog, foam, carbon dioxide or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 400°F (est.)  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 73.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 19.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (3)  
Human Oral hazard: (1)  
Human Contact hazard: I  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 98.5+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 168.31  
9.3 **Boiling Point at 1 atm:** 365–385°F = 185–196°C = 458–469°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.2937 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 23.9 dynes/cm = 0.0239 N/m at 24°C  
9.9 **Liquid Water Interfacial Tension:** 44.5 dynes/cm = 0.0445 N/m at 22.7°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** (est.) 154 Btu/lb = 58.6 cal/g = 2.45 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** –19,100 Btu/lb = –10,600 cal/g = –444 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# PROPYLENE TETRAMER

PTT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
45	48.810	85	0.510	50	1.040	46	1.615
50	48.680	90	0.515	52	1.040	48	1.581
55	48.560	95	0.520	54	1.040	50	1.548
60	48.430	100	0.525	56	1.040	52	1.516
65	48.310	105	0.531	58	1.040	54	1.485
70	48.180	110	0.536	60	1.040	56	1.455
75	48.050	115	0.541	62	1.040	58	1.425
80	47.930	120	0.546	64	1.040	60	1.397
85	47.800	125	0.552	66	1.040	62	1.369
90	47.670	130	0.557	68	1.040	64	1.342
95	47.550	135	0.562	70	1.040	66	1.316
100	47.420	140	0.568	72	1.040	68	1.291
105	47.290	145	0.573	74	1.040	70	1.266
110	47.160	150	0.578	76	1.040	72	1.241
115	47.040			78	1.040	74	1.218
				80	1.040	76	1.195
				82	1.040	78	1.173
				84	1.040	80	1.151
						82	1.130
						84	1.109
						86	1.089
						88	1.069
						90	1.050
						92	1.032
						94	1.013
						96	0.996

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	120	0.022	120	0.00059		N
	N	130	0.031	130	0.00082		O
	S	140	0.043	140	0.00113		T
	O	150	0.059	150	0.00153		
	L	160	0.081	160	0.00206		P
	U	170	0.110	170	0.00273		E
	B	180	0.147	180	0.00359		R
	L	190	0.194	190	0.00468		T
	E	200	0.254	200	0.00604		I
		210	0.330	210	0.00772		N
		220	0.424	220	0.00979		E
		230	0.542	230	0.01232		R
		240	0.686	240	0.01538		T
		250	0.863	250	0.01906		N
		260	1.077	260	0.02346		T
		270	1.335	270	0.02869		
		280	1.645	280	0.03486		
		290	2.013	290	0.04211		
		300	2.450	300	0.05057		
		310	2.965	310	0.06041		
		320	3.569	320	0.07177		
		330	4.274	330	0.08485		
		340	5.092	340	0.09983		
		350	6.038	350	0.11690		
		360	7.127	360	0.13630		
		370	8.375	370	0.15830		

# 1-PHENYL-1-XYLYL ETHANE

PXE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hatcol XPE Phenyl xylyl ethane	
Wear goggles and approved respirator. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID or SOLID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Contain  
Collection Systems: Skim

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 32; Aromatic hydrocarbons  
2.2 **Formula:** (C<sub>6</sub>H<sub>5</sub>)(C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub>)CHCH<sub>3</sub>  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** 6196-95-8  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear chemical protective goggles. Use approved respirator to protect against vapors.  
3.2 **Symptoms Following Exposure:** Currently not available  
3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 290°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 97.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 25.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: 1  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical.  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Open.  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Currently not available  
9.2 **Molecular Weight:** 210.3  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.983 @ 25°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1-PHENYL-1-XYLYL ETHANE

PXE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	8.200		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E	176	0.008	176	0.00024		C U R R E N T L Y  N O T  A V A I L A B L E



# N-PROPOXYPROPANOL

PXP

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless
Wear full impervious protective clothing and approved respirator. Notify local health and pollution control agencies. Protect water intakes.		
Fire	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Cool exposed containers with water.	
Exposure	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ethers  
2.2 Formula:  $\text{CH}_3\text{CH}_2\text{CH}_2\text{O}(\text{CH}_2)_3\text{OH}$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 128°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Not listed.
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 118.17
- 9.3 **Boiling Point at 1 atm:** 301.6°F = 149.8°C = 422.8°K
- 9.4 **Freezing Point:** -112°F = -80°C = 193°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.8865 @ 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N-PROPOXYPROPANOL

PXP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	7.400		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# QUINOLINE

QNL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Azanaphthalene 1-Benzazine Benzo (b) pyridine Chinoline Leucole	Liquid  Colorless to brown  Strong unpleasant odor  Sinks in water.
Keep people away. Avoid contact with liquid and vapor. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula: C<sub>8</sub>H<sub>7</sub>N  
 2.3 IMO/UN Designation: Not listed  
 2.4 DOT ID No.: 2656  
 2.5 CAS Registry No.: 91-22-5  
 2.6 NAERG Guide No.: 154  
 2.7 Standard Industrial Trade Classification: 51575

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** U. S. Bu. Mines approved vapor unit; chemical safety goggles; face shield; rubber gloves; coveralls and/or rubber apron; rubber shoes and boots.
- 3.2 **Symptoms Following Exposure:** Vapors are irritating to nose and throat and may cause headaches, dizziness, and nausea if inhaled. Ingestion causes irritation of mouth and stomach; vomiting may occur. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. INGESTION: give large amount of water; induce vomiting; get medical attention. EYES: flush immediately with plenty of water for at least 15 min.; call physician. SKIN: flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 460 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** 71 ppm
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 138°F C.C.
- 4.2 **Flammable Limits in Air:** LEL: 1.2%
- 4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires.
- 4.6 **Behavior in Fire:** Heat exposure may cause pressure build-up in closed containers.
- 4.7 **Auto Ignition Temperature:** 896°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** 4.06 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 55.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 13.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** May attack some forms of plastics
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 52-56 ppm/96 hr/sunfish/TL<sub>50</sub>/fresh water  
 5 ppm/96 hr/trout/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 175%, 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent; Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 129
- 9.3 **Boiling Point at 1 atm:** 459°F = 237°C = 510°K
- 9.4 **Freezing Point:** 5°F = -15°C = 258°K
- 9.5 **Critical Temperature:** 948.2°F = 509°C = 782.2°K
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.095 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 45.0 dynes/cm = 0.0450 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 4.5
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** (est.) 155 Btu/lb = 86 cal/g = 3.6 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -15,700 Btu/lb = -8,710 cal/g = -365 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# QUINOLINE

QNL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
30	69.299	34	0.350	34	1.016	10	10.030
35	69.160	36	0.350	36	1.016	15	9.280
40	69.020	38	0.350	38	1.016	20	8.599
45	68.879	40	0.350	40	1.016	25	7.981
50	68.740	42	0.350	42	1.016	30	7.419
55	68.599	44	0.350	44	1.016	35	6.906
60	68.459	46	0.350	46	1.016	40	6.438
65	68.320	48	0.350	48	1.016	45	6.010
70	68.179	50	0.350	50	1.016	50	5.618
75	68.040	52	0.350	52	1.016	55	5.259
80	67.900	54	0.350	54	1.016	60	4.929
85	67.759	56	0.350	56	1.016	65	4.625
90	67.620	58	0.350	58	1.016	70	4.345
95	67.480	60	0.350	60	1.016	75	4.087
100	67.339	62	0.350	62	1.016	80	3.849
105	67.200	64	0.350	64	1.016	85	3.628
110	67.059	66	0.350	66	1.016	90	3.424
115	66.919	68	0.350	68	1.016	95	3.235
120	66.770	70	0.350	70	1.016	100	3.059
125	66.629	72	0.350	72	1.016	105	2.896
130	66.490	74	0.350	74	1.016		
		76	0.350	76	1.016		
				78	1.016		
				80	1.016		
				82	1.016		
				84	1.016		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.600	180	0.075	180	0.00141		N
		190	0.098	190	0.00182		O
		200	0.127	200	0.00232		T
		210	0.164	210	0.00294		
		220	0.209	220	0.00369		P
		230	0.265	230	0.00462		E
		240	0.334	240	0.00573		R
		250	0.417	250	0.00707		T
		260	0.519	260	0.00867		I
		270	0.642	270	0.01057		N
		280	0.788	280	0.01281		E
		290	0.964	290	0.01545		N
		300	1.171	300	0.01853		T
		310	1.417	310	0.02212		
		320	1.705	320	0.02629		
		330	2.043	330	0.03109		
		340	2.437	340	0.03662		
		350	2.893	350	0.04295		
		360	3.421	360	0.05016		
		370	4.029	370	0.05836		
		380	4.727	380	0.06765		
		390	5.525	390	0.07814		
		400	6.433	400	0.08993		
		410	7.465	410	0.10320		
		420	8.634	420	0.11790		
		430	9.952	430	0.13440		

# RESORCINOL

RSC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,3-Benzenediol 1,3-Dihydroxybenzene m-Dihydroxybenzol Dihydroxybenzol Resorcin	Solid  White or off-white  Faint odor  Sinks and mixes with water.
<b>Keep people away. Avoid contact with solid and dust. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. CONTAINERS MAY EXPLODE IN FIRE. Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 1, 3-C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2876  
2.5 CAS Registry No.: 108-46-3  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51243

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** U. S. Bu. Mines approved respirator; rubber gloves; safety glasses with side shields or chemical goggles; coveralls or rubber apron
- 3.2 **Symptoms Following Exposure:** Inhalation of vapors or dust causes irritation of respiratory tract. Ingestion causes burns of mucous membranes, severe diarrhea, pallor, sweating, weakness, headache, dizziness, tinnitus, shock, and severe convulsions; may also cause siderosis of the spleen and tubular injury to the kidney. Contact with eyes causes irritation. Can be absorbed from wounds or through unbroken skin, producing severe dermatitis, methemoglobinemia, cyanosis, convulsions, tachycardia, dyspnea, and death.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if he is not breathing, give artificial respiration, preferably mouth-to-mouth; if breathing is difficult, give oxygen; call a physician. INGESTION: give activated charcoal; administer gastric lavage with water; consult physician. EYES: flush with water for 15 min. SKIN: flush with water.
- 3.4 TLV-TWA: 10 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 20 ppm.  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5-5 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Produces goiters in rats  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 261°F.  
4.2 Flammable Limits in Air: 1.4% at 200°F.  
4.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may cause frothing.  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Containers may explode.  
4.7 Auto Ignition Temperature: 1,125°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 30.9 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 9.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 35 ppm\*/bleak and carp/toxic threshold/fresh water  
56.4 ppm/48 hr/daphnia/TL<sub>50</sub>/fresh water  
\*Time period not specified.  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 61%, 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: USP, 99.5+%; Technical, 99%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 5000 pounds  
8.7 EPA Pollution Category: D  
8.8 RCRA Waste Number: U201  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 110.11  
9.3 Boiling Point at 1 atm: (sublimes) 531°F = 277°C = 550°K  
9.4 Freezing Point: 228°F = 109°C = 382°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.2 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: -11,200 Btu/lb = -6,200 cal/g = -259 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# RESORCINOL

RSC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	52.540	310	0.211	310	0.00281		N
36	52.890	320	0.269	320	0.00354		O
38	53.230	330	0.342	330	0.00444		T
40	53.580	340	0.431	340	0.00553		
42	53.920	350	0.541	350	0.00685		P
44	54.270	360	0.675	360	0.00844		E
46	54.610	370	0.837	370	0.01035		R
48	54.950	380	1.034	380	0.01263		T
50	55.300	390	1.270	390	0.01533		I
52	55.640	400	1.552	400	0.01852		N
54	55.990	410	1.889	410	0.02228		E
56	56.330	420	2.288	420	0.02668		N
58	56.680	430	2.760	430	0.03182		E
60	57.020	440	3.315	440	0.03780		N
62	57.370	450	3.966	450	0.04472		T
64	57.710	460	4.727	460	0.05272		
66	58.050	470	5.611	470	0.06191		
68	58.400	480	6.638	480	0.07246		
70	58.740	490	7.824	490	0.08451		
72	59.090	500	9.191	500	0.09823		
74	59.430	510	10.760	510	0.11380		
76	59.780	520	12.560	520	0.13150		
78	60.120	530	14.610	530	0.15140		
80	60.470						
82	60.810						
84	61.150						

# SODIUM ALKYL BENZENESULFONATES

SAB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Alkylbenzenesulfonic acid, sodium salt Sulfonated alkylbenzene, sodium salt	Thick liquid or solid    Pale yellow    Faint detergent odor  Mixes with water. Soap bubbles may be produced.
Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_nH_{2n+1}C_6H_5SO_3Na$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves.
- 3.2 Symptoms Following Exposure: In general, these chemicals have a moderate order of toxicity. Repeated skin contact with concentrated solutions may cause dermatitis. Ingestion may cause gastrointestinal irritation, vomiting, and diarrhea.
- 3.3 Treatment of Exposure: INGESTION: induce vomiting and call a doctor. EYES OR SKIN: flush with copious amounts of water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $LD_{50} = 0.5$  to  $5$  g/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: None
- 3.10 Vapor (Gas) Irritant Characteristics: Non-volatile
- 3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Irritating vapors may be generated.
- 4.7 Auto Ignition Temperature: Not flammable
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not flammable
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
5.6 ppm (100% SAB)/96 hr/bluegill/TL<sub>50</sub>/fresh water  
8.2 ppm/96 hr/winter flounder/TL<sub>50</sub>/salt water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): 4%, 5 days
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Vary with each manufacturer and with intended use. Some is shipped as a thick, concentrated water solution, some as a solid, often mixed with other solids such as sodium phosphate. Ordinary household detergents are good examples of this substance.
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: Not required
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: C
- 7.6 Ship Type: 3
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid or solid
- 9.2 Molecular Weight: Not pertinent
- 9.3 Boiling Point at 1 atm: Decomposes
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.0 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# SODIUM ALKYL BENZENESULFONATES

SAB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# SULFURIC ACID, SPENT

SAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dilute sulfuric acid	Oily liquid Colorless to dark brown Odorless  Sinks and mixes with water.
Keep people away. AVOID CONTACT WITH LIQUID. Wear goggles, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Poisonous gas may be produced in fire. Flammable gas may be produced on contact with metals. Wear goggles, self-contained breathing apparatus, and rubber overclothing. Extinguish adjacent fires with dry chemical or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 2; Sulfuric acid
- 2.2 Formula:  $\text{H}_2\text{SO}_4\text{-H}_2\text{O}$
- 2.3 IMO/UN Designation: 8.0/1832
- 2.4 DOT ID No.: 1832
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 137
- 2.7 Standard Industrial Trade Classification: 52232

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles and face shield; rubber gloves, boots, and apron.
- 3.2 **Symptoms Following Exposure:** Contact with eyes or skin causes severe burns, the severity depending on the strength of the acid. Ingestion can cause severe irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** Call a doctor. INGESTION: do NOT induce vomiting. SKIN OR EYES: flush affected parts with large amounts of water for at least 15 min.; do NOT use oils or ointments in eyes; treat burns.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** No effects except those stemming from tissue damage.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Non-volatile
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** None, unless strength is above 80-90%, in which case heat is liberated.
- 5.2 **Reactivity with Common Materials:**  
Attacks many metals, releasing flammable hydrogen gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Limestone, lime, or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
24.5 ppm/24 hr/bluegill/lethal/fresh water  
42.5 ppm/48 hr/prawn/LC<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Purity depends on the process in which the original acid is used. The strength (in water) is probably below 80%, and the solution may contain a wide variety of metals and organic compounds in solution.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	2
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** 212°F = 100°C = 373°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.39 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** <-418 Btu/lb = <-232 cal/g = <9.71 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SULFURIC ACID, SPENT

SAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	87.820	52	0.580		N O T		N O T
50	87.580	54	0.580				
60	87.339	56	0.580				
70	87.089	58	0.580				
80	86.849	60	0.580		P		P
90	86.610	62	0.580		E		E
100	86.360	64	0.580		R		R
110	86.120	66	0.580		T		T
120	85.879	68	0.580		I		I
130	85.639	70	0.580		N		N
140	85.389	72	0.580		E		E
150	85.150	74	0.580		N		N
160	84.910	76	0.580		T		T
170	84.669	78	0.580				
180	84.419	80	0.580				
190	84.179	82	0.580				
200	83.940	84	0.580				
210	83.690	86	0.580				
		88	0.580				
		90	0.580				
		92	0.580				
		94	0.580				
		96	0.580				
		98	0.580				
		100	0.580				
		102	0.580				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SALICYLALDEHYDE

SAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Formyl phenol O-Hydroxybenzaldehyde Salicylal Salicylic aldehyde	Liquid  Colorless or pale yellow  Bitter almond odor  Sinks and mixes slowly in water.
Keep people away. Avoid contact with vapor or liquid. Wear goggles and self-contained breathing apparatus. shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with water fog, alcohol foam, CO <sub>2</sub> or dry chemical.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: <chem>HOc1ccccc1C=O</chem> 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51622
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Rubber gloves, self-contained breathing apparatus, laboratory coat and chemical work goggles. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Irritation of mucous membranes. May effect lungs. Anesthetic and narcotic effects. EYES: Irritation, possible corneal injury. SKIN: Irritation. May cause skin rashes in sensitive individuals. INGESTION: Vomiting, abdominal pain, acidosis. 3.3 <b>Treatment of Exposure:</b> Call a doctor. INHALATION: Remove from exposure. Treat respiratory depression with artificial respiration and oxygen. EYES: Irrigate with water for at least 15 minutes. SKIN: Wash with soap and water. Remove contaminated clothing. INGESTION: Induce vomiting with ipecac. Delay absorption by giving activated charcoal. Use saline cathartic. in mild poisoning with adequate urine output and no vomiting, give milk and fruit juice every hour. Treat acidosis with sodium bicarbonate (7.5% solution). 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2: LD <sub>50</sub> = 500 to 5,000 mg/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Not pertinent 3.11 <b>Liquid or Solid Characteristics:</b> Causes smarting of the skin and first-degree burns on short exposure. may cause second-degree burns on long exposure. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 172°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Alcohol foam, water fog, dry chemical, CO<sub>2</sub>.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Can react with oxidizing materials.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 35.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** >98.5  
7.2 **Storage Temperature:** Cool.  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 122.12.  
9.3 **Boiling Point at 1 atm:** 386°F = 197°C = 470°K.  
9.4 **Freezing Point:** 19.4°F = -7°C = 266.2°K.  
9.5 **Critical Temperature:** (est.) 802.6°F = 428.1°C = 701.3°K.  
9.6 **Critical Pressure:** (est.) 590.8 psia = 40.2 atm = 4.07 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.1674 at 20°C.  
9.8 **Liquid Surface Tension:** 42.90 dynes/cm = 0.0490 N/m at 20°C.  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 4.2  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** (Est.) 145.2 Btu/lb = 80.7 cal/g = 3.37 X 10<sup>5</sup> J/kg.  
9.13 **Heat of Combustion:** at 25°C -11273 Btu/lb = -6263 cal/g = -262 X 10<sup>5</sup> J/kg.  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Probably none.  
6.5 **GESAMP Hazard Profile:** Not listed

## NOTES

# SALICYLALDEHYDE

SAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# SODIUM AMIDE

SAM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sodamide		Solid	Colorless	Odorless
		Sinks and reacts violently with water.		
Keep people away. Avoid contact with liquid and vapor. Wear rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	FLAMMABLE. POISONOUS GAS IS PRODUCED IN FIRE. DO NOT USE WATER ON FIRE. Extinguish with dry graphite, soda ash, powdered limestone, or other approved dry powder.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.			
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{NaNH}_2$   
2.3 IMO/UN Designation: 4.3/1425  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 7782-92-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51471

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; dust respirator; rubber gloves and shoes.  
3.2 **Symptoms Following Exposure:** Ammonia gas formed by reaction of solid with moisture irritates eyes and skin. Solid causes caustic burns of eyes and skin. Ingestion burns mouth and stomach in same way as caustic soda and may cause perforation of tissue.  
3.3 **Treatment of Exposure:** INGESTION: give water or milk followed by dilute vinegar or fruit juice; do NOT induce vomiting; call a doctor. SKIN OR EYES: flood all affected areas with copious amounts of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Only that of ammonia formed by reaction of solid with moisture in air.  
3.11 **Liquid or Solid Characteristics:** Burns skin and eyes just like caustic soda.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Flammable solid  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry soda ash, graphite, salt, or other recommended dry powder, such as dry limestone.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water  
4.5 **Special Hazards of Combustion**  
Products: Toxic and irritating ammonia gas may be formed.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 8.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 2.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently and frequently bursts into flames. Forms caustic soda solution.  
5.2 **Reactivity with Common Materials:**  
Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Caustic solution formed by reaction with water can be diluted with water and/or neutralized by acetic acid.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure; Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Must be dry  
7.4 **Venting:** Sealed containers must be stored in well-ventilated area.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	2

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 39.01  
9.3 **Boiling Point at 1 atm:** 752°F = 400°C = 673°K  
9.4 **Freezing Point:** 410°F = 210°C = 483°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.39 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# SODIUM AMIDE

SAM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM ARSENITE

SAR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sodium meta arsenite Sodium ortho arsenite	Solid  White to gray  Odorless  Mixes with water.
<b>KEEP PEOPLE AWAY.</b> <b>AVOID CONTACT WITH SOLID AND DUST.</b> Wear goggles and dust respirator. Stay upwind. Use water spray to "knock down" dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** Na<sub>3</sub>AsO<sub>3</sub>-NaAsO<sub>2</sub>  
2.3 **IMO/UN Designation:** Solid: 6.1/2027; Aq. soln.: 6.1/1686  
2.4 **DOT ID No.:** 1686 (aqueous), 2027 (solid)  
2.5 **CAS Registry No.:** 7784-46-5  
2.6 **NAERG Guide No.:** 154 (solution); 151 (solid)  
2.7 **Standard Industrial Trade Classification:** 52389

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; rubber gloves; goggles or face shield  
3.2 **Symptoms Following Exposure:** Dust may irritate eyes. Ingestion or excessive inhalation of dust causes irritation of stomach and intestines with nausea, vomiting, and diarrhea; bloody stools, shock, rapid pulse, coma.  
3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min. SKIN: wash with large amounts of water. INGESTION: immediately induce evacuation of intestinal tract by gastric lavage and saline cathartic; see physician immediately; consider possible development of arsenic poisoning.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; oral LD<sub>50</sub> = 42 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May be carcinogenic. Arsenic poisoning may develop.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion**  
**Products:** Toxic arsenic fumes may be formed in fires. Self-contained breathing apparatus should be used.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
36.5 mg/148 hr/rainbow trout/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** 32 mg/kg LD<sub>50</sub>  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:**  
**Bioaccumulation:** 0  
**Damage to living resources:** 3  
**Human Oral hazard:** 3  
**Human Contact hazard:** II  
**Reduction of amenities:** XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure; Technical (55-98%)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1 pound  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** 1,139°F = 615°C = 888°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.87 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM ARSENITE

SAR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# SODIUM ALKYL SULFATES

SAS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sodium hydrogen alkyl sulfate	Solid or thick liquid    Pale yellow    Faint detergent odor  Mixes with water. Soap bubbles may be produced.
Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID OR SOLID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_{12}H_{25}OSO_3Na$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.
- 3.2 **Symptoms Following Exposure:** In general, these chemicals have a moderate order of toxicity. Repeated skin contact with concentrated solutions may cause dermatitis. Ingestion may cause gastrointestinal irritation, vomiting, and diarrhea.
- 3.3 **Treatment of Exposure:** INGESTION: induce vomiting and follow with gastric lavage. SKIN: wash off with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5$  to 5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Non-volatile
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** May produce irritating vapors.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 6-7 ppm\*/fish/min lethal/fresh water \*Time period not specified
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** (theor.) 60%, 5 days
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Vary with each manufacturer and with intended use. Some is shipped as a thick concentrated water solution, some as a solid often mixed with other solids such as sodium phosphate. Ordinary household detergents are good examples of this substance.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid or solid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** Currently not available
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM ALKYL SULFATES

SAS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM FLUOROACETATE

SAT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, fluoro-, sodium salt Compound 1080 Fluoroacetic acid, sodium salt Sodium monofluoroacetate	Solid (powder)  Sinks and mixes with water.	White (may be dyed black or yellow)	Faint, vinegar-like
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED IN FIRE OR WHEN HEATED TO DECOMPOSITION. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, carbon dioxide, water spray or foam; large fires: water spray, fog or foam. Move container from fire area if you can do it without risk.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Very high acute toxicity. May be fatal if inhaled or absorbed through skin; harmful to eyes: IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open periodically if appropriate. Remove and isolate contaminated clothing and shoes at the site. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Very high acute toxicity. May be fatal if swallowed or absorbed through skin; harmful to eyes. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open periodically if appropriate. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS, have victim drink water and touch back of throat to induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CH<sub>2</sub>FCOONa  
2.3 IMO/UN Designation: 6.1/2629  
2.4 DOT ID No.: 2629  
2.5 CAS Registry No.: 62-74-8  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 51371

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Very high acute toxicity either as the dust or in solution. The lethal dose is essentially the same for exposure via inhalation, ingestion or skin contact. Contact with the eyes can also affect the body. Absorption is very rapid by the gastrointestinal tract; but skin absorption is slow unless the skin is cut or abraded. Symptoms may be delayed 30 minutes to 2 hours after ingestion; and may include vomiting, apprehension, auditory hallucinations, nystagmus, tingling sensations of the nose and face, facial numbness and twitching, and epileptiform convulsions. Several hours later, there may be pulsus alternans, ectopic heartbeats, tachycardia, ventricular fibrillation, and death. Autopsy findings pursuant to a lethal ingestion included hemorrhagic pulmonary edema and degeneration of renal tubules.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air; call emergency medical care. If breathing has stopped, give artificial respiration. EYES OR SKIN: Immediately flush eyes or skin with running water for at least 15 minutes; hold eyelids open periodically if appropriate. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If victim is CONSCIOUS, have victim drink large quantities of water and induce vomiting by touching the back of the throat. If victim is UNCONSCIOUS, do nothing except keep victim quiet and maintain normal body temperature.
- 3.4 TLV-TWA: 0.05 mg/m<sup>3</sup>  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 4; LD<sub>50</sub> = 0.220 mg/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Symptoms included severe and progressive lesions of the renal tubular epithelium along with milder hepatic, neurologic and thyroid dysfunctions. Reproductive effects were observed in the rat.  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 2.5 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 0.05 mg/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not combustible  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Small fires: Dry chemical, carbon dioxide, water spray or foam. Large fires: Water spray, fog or foam.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Contains highly toxic sodium oxide and fluoride fumes.  
4.6 Behavior in Fire: Decomposes to produce irritating and highly toxic fumes.  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Not pertinent  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Not pertinent  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: In the presence of moisture, it may react with aluminum to produce highly flammable hydrogen gas.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Oral - duck LD<sub>50</sub> = 4.810 mg/kg  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 98%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Not listed  
7.4 Venting: Not pertinent  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: P058  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 100.03  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: 292°F = 200°C = 473°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: >1 (temperature not listed)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Not pertinent

### NOTES

# SODIUM FLUOROACETATE

SAT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	111.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM ALUMINATE SOLUTION (45% OR LESS)

SAU

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless to amber	Odorless
<b>Wear full chemical protective clothing, gloves, goggles and Restrict access.</b> <b>Avoid contact with liquid and vapor.</b> <b>approved respirator.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Not flammable. Wear full protective clothing with self-contained breathing apparatus. Use extinguishing agents appropriate for the surrounding fire. Use water spray to cool exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, dilute by drinking water or milk. Do not induce vomiting. Neutralize with fruit juice.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 5; Caustics
- 2.2 Formula: NaAlO<sub>2</sub>
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: 1819
- 2.5 CAS Registry No.: 11138-49-1
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52269

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full, impervious chemical protective clothing and gloves, goggles, and approved respirator.
- 3.2 **Symptoms Following Exposure:** Material is caustic. Irritates skin, eyes, and gastrointestinal tract, causing redness of skin and eyes, burning sensation of mucous membranes.
- 3.3 **Treatment of Exposure:** Get medical attention. EYES: Flush with water for 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water and neutralize with weak vinegar. INGESTION: Dilute by drinking water or milk. Neutralize by drinking fruit juice. Do not induce vomiting.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable.
- 4.2 **Flammable Limits in Air:** Not pertinent.
- 4.3 **Fire Extinguishing Agents:** Use extinguishing agents appropriate for the surrounding fire.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent.
- 4.6 **Behavior in Fire:** Containers may burst when exposed to heat.
- 4.7 **Auto Ignition Temperature:** Not pertinent.
- 4.8 **Electrical Hazards:** Not pertinent.
- 4.9 **Burning Rate:** Not pertinent.
- 4.10 **Adiabatic Flame Temperature:** Not pertinent.
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Not pertinent.
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Not compatible with copper, tin, zinc, aluminum, acids, phosphorus, or chlorocarbons.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Weak acid.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades of varying concentrations.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Open.
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** Currently not available.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid.
- 9.2 **Molecular Weight:** 81.97
- 9.3 **Boiling Point at 1 atm:** 239°F = 115°C = 388°K
- 9.4 **Freezing Point:** 32°F = 0°C = 273°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.55 @ 25°C.
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM ALUMINATE SOLUTION (45% OR LESS)

SAU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	12.940		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# SODIUM AZIDE

SAZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hydrazoic acid, sodium salt	Solid	White	Odorless
	Mixes with water.		
<b>KEEP PEOPLE AWAY.</b> <b>AVOID CONTACT WITH SOLID AND DUST.</b> Wear goggles and dust respirator. Stay upwind. Use water spray to "knock down" dust. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Containers may explode in fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{NaN}_3$   
2.3 IMO/UN Designation: 6.1/1687  
2.4 DOT ID No.: 1687  
2.5 CAS Registry No.: 26628-22-8  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 52495

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; protective clothing; goggles.  
3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes dizziness, weakness, blurred vision, slight shortness of breath, and feeling of going to faint; moderate reduction of blood pressure and bradycardia. Contact with eyes or skin causes irritation.  
3.3 **Treatment of Exposure:** Give oxygen if weakness, pallor, or low blood pressure is observed.  
INHALATION: remove victim to fresh air; enforce rest; call a doctor. EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water. INGESTION: give large amount of water and induce vomiting at once; get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 0.11 ppm as  $\text{HN}_3$  vapor  
3.7 **Toxicity by Ingestion:** Grade 4; oral rat  $\text{LD}_{50} = 27 \text{ mg/kg}$  (technical)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Potent mutagen of salmon-sperm DNA  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion**  
Products: May form toxic hydrazoic acid fumes in fire  
4.6 **Behavior in Fire:** Containers may explode.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves to form an alkaline solution. The reaction is not hazardous.  
5.2 **Reactivity with Common Materials:**  
Forms explosion-sensitive materials with some metals such as lead, silver, mercury, and copper  
5.3 **Stability During Transport:** Stable unless in contact with acids  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.5 ppm/24 hr/bluegill/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 3  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Pure: 99+%; Practical grade  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	4
Flammability (Red).....	1
Instability (Yellow).....	3

  
8.6 EPA Reportable Quantity: 1,000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: P105  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 65  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.85 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM AZIDE

SAZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	39.200		N		N		N
36	39.400		O		O		O
38	39.600		T		T		T
40	39.800						
42	40.000		P		P		P
44	40.200		E		E		E
46	40.400		R		R		R
48	40.600		T		T		T
50	40.800		I		I		I
52	41.000		N		N		N
54	41.200		E		E		E
56	41.400		N		N		N
58	41.600		E		E		E
60	41.800		N		N		N
62	42.000		T		T		T
64	42.200						
66	42.400						
68	42.600						
70	42.800						
72	43.000						
74	43.200						
76	43.400						
78	43.600						
80	43.800						
82	44.000						
84	44.200						



# SODIUM BIFLUORIDE

SBF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sodium difluoride Sodium hydrogen difluoride Sodium hydrogen fluoride	Solid Crystalline powder  Colorless to white  Sinks and mixes with water.
Keep people away. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST OR SOLID Irritating to eyes, nose, and throat. If swallowed, will cause nausea, vomiting, abdominal pain, and diarrhea. Move to fresh air. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: NaF HF  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2439  
2.5 CAS Registry No.: 1333-83-1  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, safety glasses, self-contained breathing apparatus.  
3.2 **Symptoms Following Exposure:** INHALATION OF DUST: Irritating and possibly corrosive to mucous membranes. EYES: Irritating. INGESTION: Salty or soapy taste, salivation, nausea, burning or crampy abdominal pain, vomiting, diarrhea, muscle weakness, tremors. Rare: transient epileptiform convulsions, followed by CNS depression. Shock.  
3.3 **Treatment of Exposure:** Call a doctor. INGESTION: Gastric lavage with lime water or a 1% solution of calcium chloride. Aluminum hydroxide gel should be exceptionally effective for binding fluoride. EYES: Wash with running water or weak boric acid solution followed by water. SKIN: Wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Chronic exposure results in fluorosis. Symptoms are weight loss, brittleness of bones, anemia, weakness, stiffness of joints, and discoloration of teeth when exposure occurs during tooth development.  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with water liberating heat and forming a corrosive solution. The reaction is not hazardous.  
5.2 **Reactivity with Common Materials:**  
Aqueous solution corrodes glass, concrete, and certain metals, especially those containing silica such as cast iron. Will attack natural rubber, leather, and many organic materials. May generate hydrogen gas on contact with some metals.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Dilution action will slowly neutralize the acid while the presence of calcium will precipitate excess fluoride. Apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
The fish, Tinca Vulgaris, killed by 100 mg/l.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 61.99  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** Decomposes in melting  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 2.08 at room temperature  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.14 (calculated)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Not flammable  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Absorbs heat at 25°C  
156.8 Btu/lb = 87.1 cal/g = 3.64 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM BIFLUORIDE

SBF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
32	3.700		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM BOROHYDRIDE

SBH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Borohydride	Solid powder or pellets  White  Odorless  Sinks and mixes with water. Flammable gas is produced.
Keep people away. Avoid contact with solid and dust. Wear rubber overclothing (including gloves) and dust respirator. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Flammable, explosive gas may be produced on contact with metals, acids or when heated. DO NOT USE WATER, FOAM, CARBON DIOXIDE, OR VAPORIZING LIQUIDS. Extinguish with dry graphite, powdered limestone, soda ash, or powdered sodium chloride.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed or if skin is exposed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: NaBH<sub>4</sub>  
2.3 IMO/UN Designation: 4.3/1426  
2.4 DOT ID No.: 1426  
2.5 CAS Registry No.: 16940-66-2  
2.6 NAERG Guide No.: 138  
2.7 Standard Industrial Trade Classification: 52495

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles, rubber gloves, and protective clothing.  
3.2 **Symptoms Following Exposure:** Solid irritates skin. If ingested can form large volume of gas and lead to a gas embolism.  
3.3 **Treatment of Exposure:** INGESTION: do NOT induce vomiting; give dilute vinegar, lemon juice, milk, or olive oil; call a doctor. SKIN AND EYES: flood with large amount of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Violent reaction with acid in stomach. Considered toxic because of boron content.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available.  
3.10 **Vapor (Gas) Irritant Characteristics:** Non-volatile.  
3.11 **Liquid or Solid Characteristics:** Irritates skin.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Flammable solid  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Graphite, limestone, soda ash, sodium chloride powders  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water, carbon dioxide, or halogenated extinguishing agents.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Decomposes and produces highly flammable hydrogen gas.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 9.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 3.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts to form flammable hydrogen gas.  
5.2 **Reactivity with Common Materials:**  
Reacts with acids to form toxic, flammable diborane gas. Slowly corrodes glass.  
5.3 **Stability During Transport:** Stable unless mixed with acids or overheated, when flammable hydrogen gas is formed.  
5.4 **Neutralizing Agents for Acids and Caustics:** Caustic formed by reaction with water can be diluted and/or neutralized with acetic acid.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95-98% minimum purity; dry powder; pellets; 12% solution in 43% aqueous sodium hydroxide  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Sealed containers must be stored in well-ventilated area  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Dangerous When Wet  
8.2 **49 CFR Class:** 4.3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	1

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 37.83  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.074 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM BOROHYDRIDE

SBH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	26.320		N		N		N
36	27.650		O		O		O
38	28.990		T		T		T
40	30.320						
42	31.650		P		P		P
44	32.990		E		E		E
46	34.320		R		R		R
48	35.650		T		T		T
50	36.990		I		I		I
52	38.320		N		N		N
54	39.650		E		E		E
56	40.990		N		N		N
58	42.320		E		E		E
60	43.650		N		N		N
62	44.990		T		T		T
64	46.320						
66	47.650						
68	48.990						
70	50.320						
72	51.650						
74	52.990						
76	54.320						
78	55.650						
80	56.990						
82	58.320						
84	59.650						

# SODIUM BISULFITE

SBS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sodium acid sulfite Sodium metabisulfite Sodium pyrosulfite	Solid powder or granules      White      Odorless to irritating odor
	Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{NaHSO}_3 \cdot \text{Na}_2\text{S}_2\text{O}_5$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 7631-90-5  
2.6 NAERG Guide No.: Not listed.  
2.7 Standard Industrial Trade Classification: 52344

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Powder is irritating to eyes, nose, and throat and can irritate skin. Ingestion may cause irritation of stomach. Very large doses cause violent colic, diarrhea, depression, and death.  
3.3 **Treatment of Exposure:** INHALATION OR INGESTION: get medical attention at once. SKIN: wash with plenty of water. EYES: flush with plenty of water for at least 15 min. and get medical attention at once.  
3.4 **TLV-TWA:** 5 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Non-volatile  
3.11 **Liquid or Solid Characteristics:** Irritates skin and mucous membranes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** 240 ppm/24, 48, & 96 hr/mosquito fish/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Reacts chemically with dissolved oxygen even in absence of seeded organisms.  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Various grades (87-100%)  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 104.06  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.48 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM BISULFITE

SBS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	25.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

## SORBITOL

SBT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> D-Glucitol Hexahydric alcohol 1,2,3,4,5,6-Hexanehexol Sorbit Sorbol	Liquid  Colorless  Odorless  Sinks and mixes with water.
Avoid contact with liquid. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $\text{CH}_2\text{OH}(\text{CHOH})_4\text{CH}_2\text{OH}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 3959-53-3  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51225

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; protective clothing for hot liquid.  
3.2 Symptoms Following Exposure: Hot liquid will burn skin.  
3.3 Treatment of Exposure: Only for burns caused by hot liquid.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: None  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Non-volatile.  
3.11 Liquid or Solid Characteristics: Not pertinent  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: 542°F O.C.  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Water  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 30.9 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 13.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 43% (theor.), 6 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: USP crystalline: 93+%  
7.2 Storage Temperature: Elevated  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 182.17  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: 230°F = 110°C = 383°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.49 at 15°C (liquid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -6,750 Btu/lb = -3,750 cal/g = -157 X 10<sup>6</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: (est.) -22 Btu/lb = -12 cal/g = -0.5 X 10<sup>6</sup> J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Low

## NOTES

# SORBITOL

SBT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT PERTINENT		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	CURRENTLY NOT AVAILABLE		CURRENTLY NOT AVAILABLE		CURRENTLY NOT AVAILABLE		NOT PERTINENT



# SODIUM HYDROXIDE SOLUTION

SBX

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless	Odorless
	Mixes with water.		
Keep people away. Avoid contact with liquid and vapor. Wear rubber overclothing (including gloves) and self-contained respirator. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
Fire	Noncombustible Flammable, explosive gas may be produced on contact with metals, acids or when heated.		
Exposure	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED Extremely corrosive to eyes, skin, nose, throat, and upper respiratory tract. IF IN EYES: hold eyelids open, flush with running water for at least 15 minutes. Remove contaminated clothing and shoes, flush affected areas with plenty of running water for at least 15 minutes. IF SWALLOWED and victim is CONSCIOUS: have victim drink water, milk, dilute vinegar, lemon juice, or olive oil to dilute the material. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm. DO NOT INDUCE VOMITING		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 5; Caustics  
2.2 Formula: NaBH<sub>4</sub> and NaOH in aqueous solution  
2.3 IMO/UN Designation: 4.3/1426 & 8.0/1824  
2.4 DOT ID No.: 1824  
2.5 CAS Registry No.: Not pertinent  
2.6 NAERG Guide No.: 157  
2.7 Standard Industrial Trade Classification: 52263

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles, rubber gloves, and protective clothing.  
3.2 Symptoms Following Exposure: Liquid is extremely corrosive to the eyes, nose, throat, upper respiratory tract, and skin. If ingested can form large volume of gas and lead to a gas embolism.  
3.3 Treatment of Exposure: INGESTION: Do NOT induce vomiting; give dilute vinegar, lemon juice, milk, or olive oil; call a doctor. SKIN AND EYES: Flood with large amount of water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 4; LD<sub>50</sub> = 18 mg/kg (rat) Violent reaction with acid in stomach. Toxic because of boron content.  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Non-volatile.  
3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: May decompose and produce highly flammable hydrogen gas.  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Reacts with acid to form toxic, flammable diborane gas. Slowly corrodes glass.  
5.3 Stability During Transport: Stable unless mixed with acids or overheated.  
5.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with dilute acetic acid or vinegar.  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 12% solution in 43% aqueous sodium hydroxide.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Sealed containers must be stored in well-ventilated area.  
7.5 IMO Pollution Category: C  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: Currently not available.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	1

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: Not Pertinent  
9.3 Boiling Point at 1 atm: Currently not available  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: Not pertinent  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# SODIUM HYDROXIDE SOLUTION

SBX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# SODIUM CACODYLATE

SCD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arsenodile Arsicodile Arsycodile Phytar Sodium dimethylarsenate	Solid or solution  White solid or colorless to light yellow solution  Odorless  Mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST. Wear goggles and self-contained breathing apparatus. Stay upwind. Use water spray to "knock down" dust. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR OR DUST POISONOUS IF INHALED. Irritating to eyes. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  LIQUID OR SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $(\text{CH}_3)_2\text{AsOONa}$
- 2.3 IMO/UN Designation: 6.1/1688
- 2.4 DOT ID No.: 1688
- 2.5 CAS Registry No.: 124-65-2
- 2.6 NAERG Guide No.: 152
- 2.7 Standard Industrial Trade Classification: 52389

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; dust mask; rubber gloves
- 3.2 **Symptoms Following Exposure:** Dust may irritate eyes. Ingestion or excessive inhalation causes irritation of stomach and intestines with nausea, vomiting, diarrhea, shock, rapid pulse, coma.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; call physician. EYES: flush with water. SKIN: flush with water and wash well with soap and water. INGESTION: call physician; induce evacuation of intestinal tract by inducing vomiting, giving gastric lavage and a saline cathartic. Do NOT use BAL as an antidote.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 2,600 \text{ mg/kg (rat)}$
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
Products: Arsenic-containing fumes are emitted.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Corrodes common metals, but reaction is not hazardous.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 22-28% sodium cacodylate, 3-5% cacodylic acid, balance inert solid (or water)
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 160.0
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** (est) >1 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM CACODYLATE

SCD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	200.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM CHROMATE

SCH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Neutral sodium chromate anhydrous Sodium chromate (VI)	Solid  Yellow  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Avoid contact with solid and dust. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. May cause fire on contact with combustibles. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. If swallowed will cause nausea or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: Na <sub>2</sub> CrO <sub>4</sub> 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 7775-11-3 2.6 NAERG Guide No.: 171 2.7 Standard Industrial Trade Classification: 52389
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> U.S. Bu. Mines approved respirator; rubber gloves; chemical safety goggles; rubber apron and sleeves, face shield, rubber shoes, protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Inhalation causes irritation and may ulcerate mucous membranes; continued irritation of the nose may lead to perforation of the septum. Ingestion causes severe circulatory collapse and toxic nephritis; may be fatal. Contact with eyes causes severe irritation and possible conjunctivitis. Irritates skin and can cause ulcers; if skin is broken, prolonged contact may cause "chrome sores" (slow-healing, hard-rimmed ulcers), which leave the area vulnerable to infection as a secondary effect. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove victim to fresh air; get medical attention. INGESTION: get immediate medical help; if vomiting is not spontaneous, give an emetic such as soapy water followed by copious water intake. EYES: immediately flush with plenty of water for at least 15 min.; consult physician promptly. SKIN: immediately flush with plenty of water for at least 15 min.; persistent dermatitis should be referred to a physician; wash contaminated skin or clothing until chromate color disappears. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 3; LD <sub>50</sub> = 50-500 mg/kg 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Possible lung cancer. 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic chromium oxide fumes may form in fire.
- 4.6 **Behavior in Fire:** May increase intensity of fire when in contact with combustible material
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** In contact with combustible materials may cause fire.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
300 mg/l/24 hr/bluegill/TL<sub>50</sub>/fresh water  
40-60 ppm/288 hr/shore crab/toxic/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** Bioconcentrative to 2,000 fold but not likely to be a problem in a spill situation.
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent; Commercial; Tetrahydrate grade
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 162
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.723 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -24.5 Btu/lb = -13.6 cal/g = -0.57 X 10<sup>3</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# SODIUM CHROMATE

SCH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	34.190		N		N		N
36	36.790		O		O		O
38	39.390		T		T		T
40	41.990						
42	44.590		P		P		P
44	47.190		E		E		E
46	49.790		R		R		R
48	52.390		T		T		T
50	54.990		I		I		I
52	57.590		N		N		N
54	60.190		E		E		E
56	62.790		N		N		N
58	65.389		E		E		E
60	67.990		N		N		N
62	70.589		T		T		T
64	73.190						
66	75.790						
68	78.389						
70	80.990						
72	83.589						
74	86.190						
76	88.790						
78	91.389						
80	93.990						
82	96.589						
84	99.190						

# SULFURYL CHLORIDE

SCL

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Watery liquid      Colorless to light yellow      Acidic odor

Mixes and reacts violently with water. Poisonous gas is produced.

Evacuate.  
Keep people away. Avoid contact with liquid and gas.  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
Flammable gas may be produced on contact with metals.

### Exposure

CALL FOR MEDICAL AID.

#### VAPOR

Irritating to eyes, nose and throat.  
If inhaled, will cause coughing, difficult breathing, or loss of consciousness.  
Move to fresh air.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

#### LIQUID

Will burn skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.  
DO NOT INDUCE VOMITING.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse dissolved material  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{SO}_2\text{Cl}_2$   
2.3 IMO/UN Designation: 8.0/1834  
2.4 DOT ID No.: 1834  
2.5 CAS Registry No.: 7791-25-5  
2.6 NAERG Guide No.: 137  
2.7 Standard Industrial Trade Classification: 52241

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical goggles and face shield; mask with acid-type canister; rubber gloves and boots.
- 3.2 **Symptoms Following Exposure:** Vapors cause severe irritation of eyes and respiratory system. Liquid burns eyes and skin. If ingested, can cause severe burns of mouth and stomach.
- 3.3 **Treatment of Exposure:** Call a doctor. INHALATION: remove to fresh air; administer artificial respiration if required. INGESTION: give water or milk; do NOT induce vomiting. EYES: flush with water for at least 15 min. SKIN: wash with large amounts of water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water applied to adjacent fires should be handled carefully.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Toxic and irritating gases are generated.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously with water, releasing hydrogen chloride fumes and forming sulfuric acid.
- 5.2 **Reactivity with Common Materials:**  
Acids formed by reaction with moisture attack metals and liberate flammable hydrogen gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Acid formed by reaction with water can be neutralized by limestone, lime, or soda ash.
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: (1)  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material
- 8.2 49 CFR Class: 8
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 2              |
| Special (White).....      | W              |
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 134.97
- 9.3 **Boiling Point at 1 atm:** 156.4°F = 69.1°C = 342.3°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.67 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 4.6
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.122
- 9.12 **Latent Heat of Vaporization:** 89.1 Btu/lb = 49.5 cal/g = 2.07 X 10<sup>2</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -885.5 Btu/lb = -491.9 cal/g = -20.58 X 10<sup>2</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# SULFURYL CHLORIDE

SCL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	106.500	55	0.230		N		N
40	106.200	60	0.230		O		O
45	105.799	65	0.230		T		T
50	105.400	70	0.230				
55	105.099	75	0.230		P		P
60	104.700	80	0.230		E		E
65	104.299	85	0.230		R		R
70	104.000	90	0.230		T		T
75	103.599	95	0.230		I		I
80	103.200	100	0.230		N		N
85	102.900	105	0.230		E		E
90	102.500	110	0.230		N		N
95	102.200	115	0.230		T		T
100	101.799	120	0.230				
105	101.400	125	0.230				
110	101.099	130	0.230				
115	100.700	135	0.230				
120	100.299	140	0.230				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	0	0.289	0	0.00790	0	0.129
	E	10	0.401	10	0.01074	25	0.131
	A	20	0.550	20	0.01442	50	0.134
	C	30	0.744	30	0.01911	75	0.136
	T	40	0.995	40	0.02503	100	0.138
	S	50	1.315	50	0.03243	125	0.140
		60	1.719	60	0.04159	150	0.142
		70	2.225	70	0.05282	175	0.143
		80	2.853	80	0.06646	200	0.145
		90	3.624	90	0.08291	225	0.147
		100	4.566	100	0.10260	250	0.148
		110	5.705	110	0.12590	275	0.149
		120	7.074	120	0.15340	300	0.151
		130	8.707	130	0.18570	325	0.152
		140	10.640	140	0.22320	350	0.153
		150	12.930	150	0.26660	375	0.154
		160	15.600	160	0.31650	400	0.155
		170	18.710	170	0.37370	425	0.156
		180	22.320	180	0.43880	450	0.157
		190	26.480	190	0.51260	475	0.157
		200	31.260	200	0.59580	500	0.158
		210	36.710	210	0.68930	525	0.158
						550	0.159
						575	0.159
						600	0.159



# STRONTIUM CHROMATE

SCM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chromic acid, strontium salt (1:1) Deep lemon yellow Strontium yellow	Solid powder      Yellow      Odorless  Sinks and mixes slowly with water.
Keep people away. Avoid contact with solid and dust. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR DUST Irritating to skin, nose, and throat. Harmful if swallowed. Move to fresh air. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{SrCrO}_4$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 7789-06-2
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52389

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles. Full-cover work clothes, work gloves, and toxic dust respirator.
- 3.2 **Symptoms Following Exposure:** INHALATION: Irritating to mucous membranes. SKIN: Repeated skin contact can cause eczematous dermatitis, with edema and ulceration. INGESTION: Dizziness, intense thirst, abdominal pain, vomiting, shock and oliguria or anuria.
- 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air. EYES: Irrigate with running water for 15 minutes. Consult a physician. SKIN: Wash thoroughly with soap and water. INGESTION: Induce vomiting, give demulcents and fluids.
- 3.4 **TLV-TWA:** 0.0005  $\text{mg}/\text{m}^3$
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50} = 50$  to 500  $\text{mg}/\text{kg}$ .
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Carcinogenic.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to skin (not true for repeated contact, see 5.2).
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** 0.1  $\text{mg}/\text{m}^3$  as  $\text{CrO}_3$
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Heat stable
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Produces hazardous solution.
- 5.2 **Reactivity with Common Materials:** Avoid contact with water, acids, and bases.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Will not occur
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
For hexavalent Cr 110 to 113  $\text{ppm}/96\text{-hour}/\text{Sunfish}/\text{TL}_{50}$   
135  $\text{ppm}/96\text{-hour}/\text{Sunfish}/\text{TL}_{50}/\text{hard water}$   
103  $\text{ppm}/96\text{-hour}/\text{Bluegill}/\text{TL}_{50}$   
213  $\text{ppm}/48\text{-hour}/\text{Bluegill}/\text{TL}_{50}$   
300  $\text{ppm}/24\text{-hour}/\text{Bluegill}/\text{TL}_{50}$
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Hexavalent Cr at 100  $\text{mg}/\text{l}$  lowered the 5-day BOD by 50 percent.
- 6.4 **Food Chain Concentration Potential:** Cr will concentrate. Probable Sr accumulation factor = 150 for goldfish.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 203.64
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 3.895 at 15°C
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not flammable
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# STRONTIUM CHROMATE

SCM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210	0.139 0.327 0.515 0.704 0.892 1.080 1.268 1.456 1.645 1.833 2.021 2.209 2.398 2.586 2.774 2.962		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM CYANIDE

SCN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hydrocyanic acid, sodium salt	Solid granules, flakes or lumps	White	Almond odor
Sinks and mixes with water.			
Keep people away. AVOID CONTACT WITH SOLID, DUST, AND SOLUTION. Wear chemical protective suit with self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. Wear chemical protective suit with self-contained breathing apparatus.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: NaCN
- 2.3 IMO/UN Designation: 6.1/1689
- 2.4 DOT ID No.: 1689
- 2.5 CAS Registry No.: 143-33-9
- 2.6 NAERG Guide No.: 157
- 2.7 Standard Industrial Trade Classification: 52381

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves when handling solid sodium cyanide; rubber gloves when handling cyanide solutions (wash hands and rubber gloves thoroughly with running water after handling cyanides); U.S. Bureau of Mines approved dust respirator; approved chemical safety goggles.
- 3.2 **Symptoms Following Exposure:** As little as 180 milligrams is a rapidly fatal poison if ingested. Non-lethal doses may cause toxic symptoms. Strong water solutions, or the solid itself, can be absorbed by the skin and cause deep ulcers which heal slowly.
- 3.3 **Treatment of Exposure:** INGESTION: start treatment immediately; call a physician; carry victim to fresh air; have him lie down; keep him quiet and warm until physician arrives. If victim is conscious and breathing: induce vomiting by giving emetic of warm salt water (1 tablespoon salt/cup water); repeat until vomit fluid is clear; then have victim drink one pint of 1% solution of sodium thiosulfate, to be repeated in 15 min. If victim has stopped breathing: give artificial respiration until breathing starts. If victim is unconscious but breathing: give oxygen from an inhalator. For all of above conditions, have victim breathe amyl nitrite. Break nitrite pearl in a cloth and hold lightly under victim's nose for 15 sec., repeating 5 times at about 15-sec. intervals. If necessary, repeat this procedure every 3 min. with fresh pearls until 3 or 4 have been given. (Pearls must not be over 2 years old. Avoid breathing amyl nitrite while administering it to victim.)
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 5 mg/m<sup>3</sup>
- 3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> below 50 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Non-volatile, but moisture in air can liberate some lethal hydrogen cyanide gas.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second- degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 25 mg/m<sup>3</sup> (as cyanide)
- 3.14 **OSHA PEL-TWA:** 5 mg/m<sup>3</sup>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** When sodium cyanide dissolves in water, a mild reaction occurs and some poisonous hydrogen cyanide gas is released. This gas is not hazardous except in an enclosed space. If the water is acidic, however, toxic amounts of the gas will form at once.
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.15 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water  
0.25 ppm/48 hr/prawn/LC<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** (theor.) 6%, 7 days
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Sealed containers must be stored in well-ventilated area.
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** P106
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 49.01
- 9.3 **Boiling Point at 1 atm:** Very high
- 9.4 **Freezing Point:** 1047°F = 564°C = 837°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.60 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 88.9 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM CYANIDE

SCN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	44.430		N		N		N
36	45.480		O		O		O
38	46.520		T		T		T
40	47.570						
42	48.610		P		P		P
44	49.660		E		E		E
46	50.700		R		R		R
48	51.740		T		T		T
50	52.790		I		I		I
52	53.830		N		N		N
54	54.880		E		E		E
56	55.920		N		N		N
58	56.970		E		E		E
60	58.010		N		N		N
62	59.060		T		T		T
64	60.100						
66	61.140						
68	62.190						
70	63.230						
72	64.280						
74	65.320						
76	66.370						
78	67.410						
80	68.459						
82	69.500						
84	70.540						

# SODIUM DICHROMATE

SCR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sodium bichromate	Solid crystals Red to orange Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. Flood spill area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose, and throat. If inhaled, will cause difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. If swallowed, will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{Na}_2\text{Cr}_2\text{O}_7$   
2.3 IMO/UN Designation: 9.0/1497  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 10588-01-9  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 52389

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved dust mask; protective gloves; goggles or face shield.  
3.2 **Symptoms Following Exposure:** Inhalation of dust or mist causes respiratory irritation sometimes resembling asthma; nasal septal perforation may occur. Ingestion causes vomiting, diarrhea, and (rarely) stomach and kidney complications. Contact with eyes or skin produces local irritation; repeated skin exposure causes dermatitis.  
3.3 **Treatment of Exposure:** INGESTION: have victim drink water or milk; do NOT induce vomiting; call a doctor. SKIN OR EYE CONTACT: treat like acid burns; flush eyes with water for at least 15 min.; external lesions can be scrubbed with a 2% solution of sodium thiosulfate.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50} = 50$  to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Some suggestion of lung cancer.  
3.10 **Vapor (Gas) Irritant Characteristics:** Dusts or mists may cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Flood with water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Decomposes to produce oxygen when heated. May ignite other combustibles upon contact.  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** In contact with finely divided combustibles, such as sawdust, ignition may occur.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
145 ppm/24 hr/bluegill/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades: 98.8% to 99.9%; high-purity grades: 99.3%-99.9%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0
Special (White).....	OX

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 262.01  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** 675°F = 357°C = 630°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 2.35 at 25°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM DICHROMATE

SCR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	165.299		N		N		N
36	166.400		O		O		O
38	167.400		T		T		T
40	168.500						
42	169.500		P		P		P
44	170.599		E		E		E
46	171.599		R		R		R
48	172.599		T		T		T
50	173.699		I		I		I
52	174.699		N		N		N
54	175.799		E		E		E
56	176.799		N		N		N
58	177.900		E		E		E
60	178.900		N		N		N
62	180.000		T		T		T
64	181.000						
66	182.000						
68	183.099						
70	184.099						
72	185.199						
74	186.199						
76	187.299						
78	188.299						
80	189.400						
82	190.400						
84	191.400						

# SODIUM THIOCYANATE

SCY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Rhodanate Sodium rhodanide Sodium sulfocyanate	Solid	White	Odorless
Sinks and mixes with water.			
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: NaSCN
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 540-72-7
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52382

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber or plastic gloves; standard goggles; rubber or plastic apron
- 3.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion of large doses causes vomiting, extreme cerebral excitement, convulsions, and death in 10-48 hrs.; chronic poisoning can cause flu-like symptoms, skin rashes, weakness, fatigue, vertigo, nausea, vomiting, diarrhea, confusion. Contact with eyes causes irritation. Prolonged contact with skin may produce various skin eruptions, dizziness, cramps, nausea, and mild to severe disturbance of the nervous system.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air; if exposure has been great, get medical attention. INGESTION: consult physician; hemodialysis is recommended as the treatment of choice. EYES or SKIN: flush with water for 15 min.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes birth defects in chick embryos
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur and nitrogen may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
3,240 ppm/2 hr/fish/killed/fresh water  
>500 ppm/48 hr/green crab/TL<sub>m</sub>/aerated salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (3)  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 98%; Reagent, 99%; 50-60% solutions in water.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 81.08
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 572°F = 300°C = 573°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** >1 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 34.9 Btu/lb = 19.4 cal/g = 0.812 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 54.8 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM THIOCYANATE

SCY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	58.110		N		N		N
36	64.429		O		O		O
38	70.759		T		T		T
40	77.080						
42	83.400		P		P		P
44	89.719		E		E		E
46	96.049		R		R		R
48	102.400		T		T		T
50	108.700		I		I		I
52	115.000		N		N		N
54	121.299		E		E		E
56	127.700		N		N		N
58	134.000		E		E		E
60	140.299		N		N		N
62	146.599		T		T		T
64	152.900						
66	159.299						
68	165.599						
70	171.900						
72	178.199						
74	184.599						
76	190.900						
78	197.199						
80	203.500						
82	209.799						
84	216.199						



# SODIUM ARSENATE

SDA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Disodium arsenate heptahydrate Sodium arsenate, dibasic	Solid  White  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause coughing, nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{Na}_2\text{HAsO}_4 \cdot 7\text{H}_2\text{O}$   
2.3 IMO/UN Designation: 6.1/1685  
2.4 DOT ID No.: 1685  
2.5 CAS Registry No.: 7631-89-2  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 52389

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves  
3.2 **Symptoms Following Exposure:** Inhalation of massive doses can cause laryngitis, bronchitis. Ingestion causes constriction in throat and difficulty in swallowing; also causes burning and pain, vomiting, profuse diarrhea, dehydration, cyanosis, coma, convulsions, and death. Contact with eyes causes irritation. Contact with skin causes various skin eruptions, more often as a late manifestation, or chronic poisoning.  
3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; support respiration. INGESTION: gastric lavage with water, followed by 1 glass of milk; consult physician. EYES: flush with water for at least 15 min. SKIN: flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4;  $\text{LD}_{50}$  <50 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Possible carcinogenic effects on skin and lungs.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
234 ppm\*/minnows/lethal conc./fresh water  
32 ppm/7 days/goldfish/TL<sub>50</sub>/fresh water  
\*Time period not specified.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** Bioconcentrative only 300 fold; not likely to be a problem in spill situation.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent; Technical, 98+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 1 pound  
8.7 EPA Pollution Category: X  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 312  
9.3 **Boiling Point at 1 atm:** (decomposes) 356°F = 180°C = 453°K  
9.4 **Freezing Point:** 135°F = 57°C = 330°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.87 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM ARSENATE

SDA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
59	159.699		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM BORATE

SDB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Borax, anhydrous Sodium borate Sodium pyroborate Sodium tetraborate, anhydrous	Solid  White  Odorless  Sinks and mixes slowly with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If in eyes, hold eyelids open and flush with plenty of water.  SOLID Irritating to skin and eyes. If swallowed will cause headache, dizziness, nausea, or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Na}_2\text{B}_4\text{O}_7$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 1344-90-7
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52384

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask and goggles or face shield
- 3.2 Symptoms Following Exposure: No adverse effects from inhaling borax have been reported. Ingestion may cause acute or chronic effects; initial symptoms are nausea, vomiting, and diarrhea; these may be followed by weakness, depression, headaches, skin rashes, drying skin, cracked lips, and loss of hair; shock may follow ingestion of large doses and may interfere with breathing. Eye contact with powder or solutions may cause irritation; no chronic effects have been recognized, but continued contact should be avoided. Local skin irritation may result from contact with powder or strong solutions; the latter may cause chronic dermatitis on prolonged contact, and if skin is broken, enough boron may be absorbed to cause boron poisoning (symptoms are similar to those for ingestion).
- 3.3 Treatment of Exposure: INHALATION: move to fresh air; call physician immediately; give mouth-to-mouth resuscitation if breathing has ceased; give oxygen if authorized by physician; keep victim warm. INGESTION: get medical attention quickly; if victim is conscious, give warm salty or soapy water to induce vomiting; repeat until vomitus is clear; additional water may be given to wash out stomach. EYES: get medical attention quickly; flush with copious amounts of water for at least 15 min. (30 min. if physician is not available), holding eyelids apart. SKIN: flush with water; remove contaminated clothing under shower; do not use chemical neutralizers; get medical attention unless burn is minor.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5\text{--}5 \text{ g/kg}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Compound melts to a glassy material that may flow in large quantities and ignite combustibles elsewhere.
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 3,000-3,300 ppm\*/minnow/min. lethal dose/fresh water  
8,200 ppm/48 hr/mosquitofish/TL\*/fresh water  
\*Time period not specified.
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: In addition to anhydrous sodium borate, both pentahydrate and decahydrate are commercially available, all in technical grade. The decahydrate is also available in U.S.P. grade.
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 201.26
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.367 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: -92 Btu/lb = -51 cal/g = -2.1 X 10<sup>5</sup> J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# SODIUM BORATE

SDB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.720		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM CHLORATE

SDC

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid crystals or powder      Colorless to pale yellow      Odorless

Sinks and mixes with water.

Avoid contact with solid.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
CONTAINERS MAY EXPLODE IN FIRE.  
May cause fire on contact with combustibles.  
Combat adjacent fires from a safe distance or protected location.  
Flood discharge area with water.  
Cool exposed containers with water.  
Continue cooling after fire has been extinguished.

### Exposure

CALL FOR MEDICAL AID.  
  
SOLID  
Irritating to skin and eyes.  
Harmful if swallowed.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Dangerous to aquatic life in high concentrations.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{NaClO}_3$   
2.3 IMO/UN Designation: 5.1/1495  
2.4 DOT ID No.: 1495  
2.5 CAS Registry No.: 7775-09-9  
2.6 NAERG Guide No.: 140  
2.7 Standard Industrial Trade Classification: 52332

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Clean work clothing (must be washed well with water after each exposure); rubber gloves and shoes; where dusty, goggles and an approved dust respirator. Do NOT use oils, greases, or protective creams on skin.
- 3.2 **Symptoms Following Exposure:** Ingestion of a toxic dose (at least 1/2 oz.) leads to severe gastroenteric pain, vomiting, and diarrhea. Possible respiratory difficulties, including failure of respiration. Kidney and liver injury may also be produced. The lethal oral dose for an adult is approximately 15 gm. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** INGESTION: induce vomiting and follow with gastric lavage, saline cathartics, fluid therapy, and oxygen. EYES: wash thoroughly with water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Non-volatile  
3.11 **Liquid or Solid Characteristics:** Prolonged exposure to solid or dust may irritate skin.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable but supports combustion.
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Fire blankets
- 4.5 **Special Hazards of Combustion Products:** In fire situations oxygen may be liberated and increase the intensity of the fire.
- 4.6 **Behavior in Fire:** Melts, then decomposes to give oxygen gas that increases the intensity of fire. Reacts explosively, either as a solid or a liquid, with all organic matter and some metals.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Chlorates are powerful oxidizing agents and can cause explosions when heated or rubbed with wood, organic matter, sulfur, and many metals. Even water solutions react in this way if stronger than 30%, especially when warm.
- 5.3 **Stability During Transport:** Starts at 572°F with evolution of oxygen gas. Decomposition may be self-sustaining. Oxygen increases intensity of fires.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
11,000 ppm/perch/threshold toxicity/fresh water  
3.8 ppm/scenedesmus/threshold toxicity/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 2  
Human Contact hazard: 0  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical (99.5% minimum); treated (99.0% minimum)
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0 1            |
| Flammability (Red).....   | 0 0            |
| Instability (Yellow)..... | 2 2            |
| Special (White).....      | OX OX          |

- \* First column refers to non-fire situation.
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 106.45
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** 478°F = 248°C = 521°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.49 at 15°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# SODIUM CHLORATE

SDC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	80.209		N		N		N
36	81.429		O		O		O
38	82.650		T		T		T
40	83.879						
42	85.099		P		P		P
44	86.320		E		E		E
46	87.540		R		R		R
48	88.759		T		T		T
50	89.990		I		I		I
52	91.209		N		N		N
54	92.429		E		E		E
56	93.650		N		N		N
58	94.879		E		E		E
60	96.099		N		N		N
62	97.320		T		T		T
64	98.540						
66	99.759						
68	101.000						
70	102.200						
72	103.400						
74	104.700						
76	105.900						
78	107.099						
80	108.299						
82	109.500						
84	110.799						

# SODIUM CHLORATE SOLUTION

SDD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlorate of soda Soda chloric acid, sodium salt	Liquid	Colorless to pale yellow	Odorless
Mixes with water.			
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable; but can support combustion, especially if heated to dryness. May cause fire on contact with combustibles. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Move container from fire area if you can do it without risk.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin, eyes and mucous membranes. Harmful if swallowed. IF IN EYES OR ON SKIN, flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 0; Unassigned cargoes  
2.2 Formula: NaClO<sub>3</sub>  
2.3 IMO/UN Designation: 5.1/2428  
2.4 DOT ID No.: 2428  
2.5 CAS Registry No.: 7775-09-9  
2.6 NAERG Guide No.: 140  
2.7 Standard Industrial Trade Classification: 52332

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.  
3.2 **Symptoms Following Exposure:** Contact causes irritation of eyes and skin. INGESTION: May cause nausea, vomiting, diarrhea, abdominal or gastric pain, dyspnea and other symptoms. The major cause of death from a lethal dose is acute renal failure.  
3.3 **Treatment of Exposure:** EYES OR SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. INGESTION: If victim is CONSCIOUS, have victim drink water or milk and induce vomiting. IF UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 1.2 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May cause mutagenic effects.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Irritating to eyes and skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable but can support combustion, especially if dried.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion**  
**Products:** May contain oxygen (increase fire intensity) along with toxic chloride and sodium oxide fumes.  
4.6 **Behavior in Fire:** Evaporation of water produces concentrated solutions or the dry salt. They can decompose to produce oxygen gas which increases fire intensity, and they can form explosive mixtures with organic matter and other easily oxidizable materials that are readily ignited by heat.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Not pertinent  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Not pertinent  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Chlorates are powerful oxidizing agents and can cause explosions when mixed or heated with organic matter and many metals. Even water solutions react in this way if stronger than 30%, especially when warm.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
11,000 ppm/perch/threshold toxicity/fresh water  
308 ppm/scendesmus/threshold toxicity/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 2  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 50% or less  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** III  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer  
8.2 **49 CFR Class:** 5.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Not pertinent  
9.19 **Reid Vapor Pressure:** Not pertinent

### NOTES

# SODIUM CHLORATE SOLUTION

SDD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# SODIUM FLUORIDE

SDF

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Solid crystals or powder	White or tinted blue	Odorless
	Sinks in water.		
Notify local health and pollution control agencies. Protect water intakes.			
Fire	Not flammable.		
Exposure	CALL FOR MEDICAL AID.  SOLID Poisonous if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: NaF
- 2.3 IMO/UN Designation: 6.1/1690
- 2.4 DOT ID No.: 1690
- 2.5 CAS Registry No.: 7681-49-4
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield.
- 3.2 Symptoms Following Exposure: Ingestion may cause vomiting, abdominal pain, diarrhea, convulsions, collapse, thirst, disturbed color vision, acute toxic nephritis.
- 3.3 Treatment of Exposure: INGESTION: promptly administer gastric lavage with lime water or 1% calcium chloride solution; support respiration; call a physician.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg (rabbit, rat)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Non-volatile.
- 3.11 Liquid or Solid Characteristics: None
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not flammable
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not flammable
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 419 ppm/96 hr/mosquito fish/TL<sub>m</sub>/fresh water  
>300 ppm/48 hr/shrimp/LC<sub>50</sub>/salt water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 2  
Human Contact hazard: 1  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 97.5+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 41.99
- 9.3 Boiling Point at 1 atm: Very high
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.79 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: 166.7 cal/g
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

NOTES

# SODIUM FLUORIDE

SDF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	3.682		N		N		N
36	3.704		O		O		O
38	3.726		T		T		T
40	3.749						
42	3.771		P		P		P
44	3.793		E		E		E
46	3.815		R		R		R
48	3.838		T		T		T
50	3.860		I		I		I
52	3.882		N		N		N
54	3.904		E		E		E
56	3.926		N		N		N
58	3.949		E		E		E
60	3.971		N		N		N
62	3.993		T		T		T
64	4.015						
66	4.038						
68	4.060						
70	4.082						
72	4.104						
74	4.126						
76	4.149						
78	4.171						
80	4.193						
82	4.215						
84	4.238						

# SODIUM HYDRIDE

SDH

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Powder in oil	Gray	Kerosene odor
Reacts violently with water. Flammable gas is produced.			
Evacuate. Keep people away. Avoid contact with discharged material. Wear rubber overclothing (including gloves). Shut off ignition sources and call fire department. Notify local health and pollution control agencies.			
Fire	FLAMMABLE. MAY EXPLODE ON CONTACT WITH WATER. DO NOT USE WATER, FOAM, SODA ACID, DRY CHEMICAL OR CARBON DIOXIDE ON FIRE. Extinguish with powdered limestone, soda ash, or dry graphite.		
Exposure	CALL FOR MEDICAL AID.  SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: NaH  
2.3 IMO/UN Designation: 4.3/1427  
2.4 DOT ID No.: 1427  
2.5 CAS Registry No.: 7646-69-7  
2.6 NAERG Guide No.: 138  
2.7 Standard Industrial Trade Classification: 52495

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Face shield; rubber gloves.  
3.2 Symptoms Following Exposure: Moisture of body converts compound to caustic soda, which irritates all tissues.  
3.3 Treatment of Exposure: INGESTION: do NOT induce vomiting; neutralize alkali in stomach by drinking dilute vinegar, lemon juice, or orange juice; call a physician. SKIN CONTACT: brush off all particles at once and flood the affected area with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Non-volatile  
3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:  
Oil is flammable  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Powdered limestone and nitrogen-propelled dry powder.  
4.4 Fire Extinguishing Agents Not to Be Used: Water, soda acid, dry chemical, carbon dioxide, or foam.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Accidental contact with water used to extinguish surrounding fire will result in the release of hydrogen gas and possible explosion  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 2.4 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 1.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Vigorous reaction with release of flammable hydrogen gas. Ignition of hydrogen is infrequent.  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable below 225°C  
5.4 Neutralizing Agents for Acids and Caustics: Neutralize only when accidental reaction with water is complete. Do not neutralize the flammable solid with aqueous solutions. Spent reaction solution may be neutralized with dilute solutions of acetic acid.  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
125 ppm/96 hr/mosquito fish/TL<sub>50</sub>/fresh water  
180 ppm/23 hr/oysters/lethal/salt water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 55% plus 45% mineral oil  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Must be dry  
7.4 Venting: Pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Dangerous When Wet  
8.2 49 CFR Class: 4.3  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	2
Special (White).....	W

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: Not applicable  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: Currently not available  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# SODIUM HYDRIDE

SDH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM NITRATE

SDN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chile saltpeter Nitratine Soda niter	Solid, granular  Colorless to white  Odorless  Sinks and mixes with water.
Evacuate. Keep people away. Avoid contact with solid and dust. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. May cause fire and explode on contact with combustibles. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Floor discharged area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID If swallowed, may cause dizziness, abdominal cramps, vomiting, convulsions, and collapse. Flush exposed areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in very high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{NaNO}_3$
- 2.3 IMO/UN Designation: 5.1/1498
- 2.4 DOT ID No.: 1498
- 2.5 CAS Registry No.: 7631-99-4
- 2.6 NAERG Guide No.: 140
- 2.7 Standard Industrial Trade Classification: 52359

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Rubber gloves, goggles, laboratory coat.
- 3.2 Symptoms Following Exposure: INGESTION: Dizziness, abdominal cramps, vomiting, bloody diarrhea, weakness, convulsions, and collapse. Small repeated doses may cause headache and mental impairment.
- 3.3 Treatment of Exposure: See a physician. EYES: Rinse with water. SKIN: Wash with water for 15 minutes. INGESTION: Drink water, milk, or activated charcoal; then induce vomiting or gastric lavage followed by catharsis.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 1;  $\text{LD}_{50}$  = 5 to 15 g/kg.
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Ingestion of nitrates has been implicated with cancer increase.
- 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Use flooding amounts of water.
- 4.4 Fire Extinguishing Agents Not to Be Used: Currently not available
- 4.5 Special Hazards of Combustion Products: Yields toxic gaseous oxides of nitrogen when involved in fire.
- 4.6 Behavior in Fire: Explodes when heated to over 1000°C.
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Not flammable
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Oxidizable substances, organic materials
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Will not occur.
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 6,650 ppm/96-hour/Mosquito fish/TL<sub>m</sub>/Turbid water  
10,000 ppm/96-hour-Bluegill/TL<sub>m</sub>  
11,060 ppm/96-hour/Stickleback/TL<sub>m</sub>/tap water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): 0 lb/lb, 5 days
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile: Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Purified-at least 99%  $\text{NaNO}_3$
- 7.2 Storage Temperature: Cool
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer
- 8.2 49 CFR Class: 5.1
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	0 1
Flammability (Red).....	0 0
Instability (Yellow).....	0 0
Special (White).....	OX OX

\* First column refers to non-fire situation.

- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 84.99
- 9.3 Boiling Point at 1 atm: Decomposes 716°F = 380°C = 653.2°K
- 9.4 Freezing Point: 584.2°F = 306.8°C = 580.0°K
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 2.26 at room temperature
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: 2.93 (calculated)
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: At 25°C -108 Btu/lb = -60.1 cal/g = -2.52 X 10<sup>5</sup> J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: 44.2 cal/g
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# SODIUM NITRATE

SDN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
40	76.089		N		N		N
50	79.950		O		O		O
60	84.007		T		T		T
70	88.268						
80	92.747		P		P		P
90	97.452		E		E		E
100	102.398		R		R		R
110	107.592		T		T		T
120	113.051		I		I		I
130	118.787		N		N		N
140	124.815		E		E		E
150	131.147		N		N		N
160	137.801		E		E		E
170	144.792		N		N		N
180	152.139		T		T		T
190	159.858						
200	167.969						
210	176.491						

# SODIUM SULFIDE

SDS

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid flakes      Yellow to red      Rotten eggs odor

Sinks and mixes with water.

Keep people away. Avoid contact with solid and dust.  
Wear rubber overclothing (including gloves) and dust respirator.  
Call fire department.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Combustible.  
POISONOUS GAS MAY BE PRODUCED IN FIRE.  
Flammable, poisonous gas is formed on contact with acids.  
WEAR GOGGLES AND SELF-CONTAINED BREATHING APPARATUS.  
Extinguish with water.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
Irritating to eyes, nose and throat.  
Move to fresh air.  
IF IN EYES, hold eyelids open and flush with plenty of water.

SOLID  
Harmful if swallowed.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge  
Do not burn

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: Na<sub>2</sub>S
- 2.3 IMO/UN Designation: 4.2/1385
- 2.4 DOT ID No.: 1385 (anhydrous)
- 2.5 CAS Registry No.: 1313-82-2
- 2.6 NAERG Guide No.: 135
- 2.7 Standard Industrial Trade Classification: 52341

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield.
- 3.2 Symptoms Following Exposure: Caustic action on skin and eyes. If ingested may liberate hydrogen sulfide in stomach.
- 3.3 Treatment of Exposure: INGESTION: give water; induce vomiting; call a doctor. SKIN OR EYE CONTACT: wash with water for at least 15 min.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 50-500 mg/kg (human)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: None
- 3.10 Vapor (Gas) Irritant Characteristics: Non-volatile.
- 3.11 Liquid or Solid Characteristics: Irritates skin and mucous membranes.
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Moderately flammable solid
- 4.2 Flammable Limits in Air: Not pertinent
- 4.3 Fire Extinguishing Agents: Water
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Irritating sulfur dioxide is produced in fire.
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 5.9 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 2.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 61 ppm/48 hr/bluegill, sunfish/TL<sub>m</sub>/fresh water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 2
  - Human Oral hazard: 1
  - Human Contact hazard: 0
  - Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Crystals, 60-62%, plus water; fused chips
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: B
- 7.6 Ship Type: 3
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Spontaneously Combustible
- 8.2 49 CFR Class: 4.2
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 78.4
- 9.3 Boiling Point at 1 atm: Very high
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.856 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: 15.4 cal/g
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# SODIUM SULFIDE

SDS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	9.996		N		N		N
36	10.400		O		O		O
38	10.800		T		T		T
40	11.200						
42	11.600		P		P		P
44	12.000		E		E		E
46	12.400		R		R		R
48	12.800		T		T		T
50	13.200		I		I		I
52	13.600		N		N		N
54	14.000		E		E		E
56	14.400		N		N		N
58	14.800		E		E		E
60	15.200		N		N		N
62	15.600		T		T		T
64	16.000						
66	16.400						
68	16.800						
70	17.200						
72	17.600						
74	18.000						
76	18.400						
78	18.800						
80	19.200						
82	19.600						
84	20.000						



# SODIUM DICHLORO-S-TRIAZINETRIONE

SDT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sodium dichloroisocyanurate		Solid	White	Bleach-like odor
		Mixes with water.		
<b>Keep people away.</b> <b>Avoid contact with solid and dust.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>				
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Flood discharge area with water.			
<b>Exposure</b>	Call for medical aid. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{NaCl}(\text{NCO})_3$   
2.3 IMO/UN Designation: 5.1/2465  
2.4 DOT ID No.: 2465  
2.5 CAS Registry No.: 10119-30-9  
2.6 NAERG Guide No.: 141  
2.7 Standard Industrial Trade Classification: 51577

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask or chlorine-canister mask; goggles; rubber gloves and other protective clothing to prevent contact with skin  
3.2 **Symptoms Following Exposure:** Dust causes sneezing and coughing, moderate irritation of the eyes, and itchiness and redness of the skin. Ingestion causes burns of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. EYES: flush with water for 15 min.; call a physician. SKIN: flush with water. INGESTION: induce vomiting; call physician.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 1,670 \text{ mg/kg}$  (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Effects unknown in experimental animals  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable, but contact with ordinary combustibles may cause fire.  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** May form toxic chlorine and other gases in fire.  
4.6 **Behavior in Fire:** Decomposition can be initiated with a heat source and can propagate throughout the mass with the evolution of dense fumes. Containers may explode when heated.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Forms a bleach solution; the reaction is not violent.  
5.2 **Reactivity with Common Materials:**  
Contact with most foreign materials, organic matter, or easily chlorinated or oxidized materials may result in fire.  
Avoid contact with oil, grease, sawdust, floor sweepings, easily oxidized organics.  
5.3 **Stability During Transport:** Stable if dry  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 39-60% available chlorine  
7.2 **Storage Temperature:** Cool ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer  
8.2 **49 CFR Class:** 5.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	2
Special (White).....	OX

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 220.0  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.96 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM DICHLORO-S-TRIAZINETRIONE

SDT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	33.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM

SDU

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Soft solid under kerosene Silver to grayish-white Odorless

Floats and reacts violently with water. Flammable gas is produced.

Evacuate.  
Keep people away. **AVOID CONTACT WITH SOLID.**  
Shut off ignition sources and call fire department.  
Wear goggles, and rubber overclothing (including gloves).  
Notify local health and pollution control agencies.

### Fire

FLAMMABLE.  
FIRE MAY START ON CONTACT WITH AIR.  
Flammable gas formed on contact with water or moisture.  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  
DO NOT USE WATER, CARBON DIOXIDE, OR VAPORIZING LIQUIDS.  
Extinguish with dry graphite, soda ash, powdered sodium chloride or other approved dry powder.

### Exposure

CALL FOR MEDICAL AID.

SOLID  
Will burn skin and eyes.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.

### Water Pollution

Dangerous to aquatic life in high concentrations.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse dissolved material  
Stop discharge  
Do not add water to undissolved material  
Do not burn

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Na  
2.3 IMO/UN Designation: 4.3/1428  
2.4 DOT ID No.: 1428  
2.5 CAS Registry No.: 7440-23-5  
2.6 NAERG Guide No.: 138  
2.7 Standard Industrial Trade Classification: 52228

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Maximum protective clothing; goggles and face shield.
- 3.2 **Symptoms Following Exposure:** Severe burns caused by burning metal or by caustic soda formed by reaction with moisture on skin.
- 3.3 **Treatment of Exposure:** SKIN: brush off any metal, then flood with water for at least 15 min.; treat as heat or caustic burn; call a doctor.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Non-volatile
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Dry soda ash, graphite, salt, or other approved dry powder such as dry limestone.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, carbon dioxide or halogenated extinguishing agents.
- 4.5 **Special Hazards of Combustion Products:** Fumes of burning Na are highly irritating to skin, eyes, and mucous membranes.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 250°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 1.2 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 0.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently, with formation of flammable hydrogen gas and caustic soda solution. A fire often occurs.
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** After reaction with water, caustic soda formed can be diluted with water and/or neutralized with acetic acid.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Not pertinent
- 6.2 **Waterfowl Toxicity:** Not pertinent
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial grade: 99.95%
- 7.2 **Storage Temperature:** 230°–250°F (liquid); ambient (solid)
- 7.3 **Inert Atmosphere:** Dry nitrogen or argon (for liquid); under kerosene (for solid)
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Dangerous When Wet
- 8.2 **49 CFR Class:** 4.3
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 2              |
| Special (White).....      | W              |
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 22.49
- 9.3 **Boiling Point at 1 atm:** 1621°F = 883°C = 1156°K
- 9.4 **Freezing Point:** 207.5°F = 97.5°C = 370.7°K
- 9.5 **Critical Temperature:** 3632.0°F = 2000°C = 2273.2°K
- 9.6 **Critical Pressure:** 5040 psia = 343 atm = 34.8 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.971 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 27.4 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# SODIUM

SDU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SULFURIC ACID

SFA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Battery acid Chamber acid Fertilizer acid Oil of vitriol	Oily liquid  Colorless  Odorless  Sinks and mixes violently with water. Irritating mist is produced.
<b>Keep people away. AVOID CONTACT WITH LIQUID.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. Flammable gas may be produced on contact with metals. <b>POISONOUS GAS MAY BE PRODUCED IN FIRE.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing. <b>DO NOT USE WATER ON ADJACENT FIRES.</b> Extinguish with dry chemical or carbon dioxide.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b> <b>MIST</b> Irritating to eyes, nose and throat. If inhaled, will cause coughing, difficult breathing, or loss of consciousness. Move to fresh air. IF IN EYES, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. <b>DO NOT INDUCE VOMITING.</b>
<b>Water Pollution</b>	<b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 2; Sulfuric acid  
2.2 Formula: H<sub>2</sub>SO<sub>4</sub>  
2.3 IMO/UN Designation: 8.0/1830  
2.4 DOT ID No.: 1830  
2.5 CAS Registry No.: 7664-93-9  
2.6 NAERG Guide No.: 137  
2.7 Standard Industrial Trade Classification: 52232

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety shower; eyewash fountain; safety goggles; face shield; approved respirator (self-contained or air-line); rubber safety shoes; rubber apron.
- 3.2 **Symptoms Following Exposure:** Inhalation of vapor from hot, concentrated acid may injure lungs. Swallowing may cause severe injury or death. Contact with skin or eyes causes severe burns.
- 3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Observe victim for delayed pulmonary reaction. INGESTION: Have victim drink water if possible; do NOT induce vomiting. EYES AND SKIN: Wash with large amounts of water for at least 15 min.; do not use oils or ointments in eyes; treat skin burns.
- 3.4 TLV-TWA: 1 mg/m<sup>3</sup>  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 3 mg/m<sup>3</sup> (mist)  
3.7 **Toxicity by Ingestion:** No effects except those secondary to tissue damage.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors from hot acid (77-98%) cause moderate irritation of eyes and respiratory system. Effect is temporary.  
3.11 **Liquid or Solid Characteristics:** 77-98% acid causes severe second- and third-degree burns of skin on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Greater than 1 mg/m<sup>3</sup>  
3.13 **IDLH Value:** 15 mg/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 1 mg/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water used on adjacent fires should be carefully handled.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not flammable
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** None
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently with evolution of heat. Spattering occurs when water is added to the compound.
- 5.2 **Reactivity with Common Materials:**  
Extremely hazardous in contact with many materials, particularly metals and combustibles. Dilute acid reacts with most metals, releasing hydrogen which can form explosive mixtures with air in confined spaces.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water, then neutralize with lime, limestone, or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
24.5 ppm/24 hr/bluegill/lethal/fresh water  
42.5 ppm/48 hr/prawn/LC<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** CP; USP; Technical, at 33% to 98% (50° Be to 66° Be).
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 2              |
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCL List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 98.08
- 9.3 **Boiling Point at 1 atm:** 644°F = 340°C = 613°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.84 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -418.0 Btu/lb = -232.2 cal/g = -9.715 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Low \*Physical properties apply to concentrated (98%) acid unless otherwise stated. More dilute acid is more water-like.

### NOTES

# SULFURIC ACID

SFA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	115.400	35	0.330		N O T		N O T
40	115.200	40	0.331				
45	115.000	45	0.331				
50	114.900	50	0.332				
55	114.700	55	0.333		P		P
60	114.500	60	0.333		E		E
65	114.299	65	0.334		R		R
70	114.200	70	0.334		T		T
75	114.000	75	0.335		I		I
80	113.799	80	0.335		N		N
85	113.599	85	0.336		E		E
90	113.500	90	0.336		N		N
95	113.299	95	0.337		T		T
100	113.099	100	0.338				
105	112.900	105	0.338				
110	112.799	110	0.339				
115	112.599	115	0.339				
120	112.400	120	0.340				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM FERROCYANIDE

SFC

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid                      Yellow                      Odorless

Sinks and mixes with water.

Avoid contact with solid.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.

#### SOLID

Harmful if swallowed.

IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, have victim induce vomiting.

IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Na}_4\text{Fe}(\text{CN})_6$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52381

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: U.S. Bureau of Mines respirator for excessive dustiness; safety goggles.
- 3.2 Symptoms Following Exposure: None recorded.
- 3.3 Treatment of Exposure: None is required except for ingestion of a huge dose, in which case the stomach should be emptied by inducing vomiting.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: 5 mg/m<sup>3</sup> as cyanide
- 3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Non-volatile.
- 3.11 Liquid or Solid Characteristics: None
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: 25 mg/m<sup>3</sup> as cyanide
- 3.14 OSHA PEL-TWA: 5 mg/m<sup>3</sup> as cyanide
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not flammable
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not flammable
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 540 mg/l/daphnia magna/toxic conc./fresh water  
\*Time period not specified
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): 0 lb/lb
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 484.04
- 9.3 Boiling Point at 1 atm: Decomposes
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.458 at 25°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# SODIUM FERROCYANIDE

SFC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	11.640		N		N		N
36	12.080		O		O		O
38	12.530		T		T		T
40	12.970						
42	13.420		P		P		P
44	13.860		E		E		E
46	14.310		R		R		R
48	14.750		T		T		T
50	15.200		I		I		I
52	15.640		N		N		N
54	16.080		E		E		E
56	16.530		N		N		N
58	16.970		E		E		E
60	17.420		N		N		N
62	17.860		T		T		T
64	18.310						
66	18.750						
68	19.200						
70	19.640						
72	20.080						
74	20.530						
76	20.970						
78	21.420						
80	21.860						
82	22.310						
84	22.750						



# SULFUR DIOXIDE

SFD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Liquefied compressed gas Colorless Sharp irritating odor  Liquid sinks and boils in water. Poisonous visible vapor cloud is produced.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Wear goggles and self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Wear goggles and self-contained breathing apparatus. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: SO<sub>2</sub>  
2.3 IMO/UN Designation: 2.0/1079  
2.4 DOT ID No.: 1079  
2.5 CAS Registry No.: 7446-09-5  
2.6 NAERG Guide No.: 125  
2.7 Standard Industrial Trade Classification: 52238

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask or approved canister; goggles or face shield; rubber gloves; rubber clothing where contact with liquid is possible.  
3.2 **Symptoms Following Exposure:** Vapors cause irritation of eyes and lungs, with severe choking.  
3.3 **Treatment of Exposure:** INHALATION: remove from exposure; support respiration; administer oxygen; call a doctor. SKIN: flush with water after exposure to liquid. EYES: wash promptly for at least 15 min.; call physician.  
3.4 **TLV-TWA:** 2 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 5 ppm  
3.7 **Toxicity by Ingestion:** Not pertinent  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Liquid can cause frostbite.  
3.12 **Odor Threshold:** 3 ppm  
3.13 **IDLH Value:** 100 ppm  
3.14 **OSHA PEL-TWA:** 5 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Containers may rupture and release irritating, toxic sulfur dioxide  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with water to form corrosive acid. The reaction is not hazardous.  
5.2 **Reactivity with Common Materials:** Corrodes aluminum  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Mild acidity of water solution may be neutralized by dilute caustic soda  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 5 ppm/1 hr/trout/lethal/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Refrigeration grade 99.98%; commercial grade 99.90%  
7.2 **Storage Temperature:** Less than 130°F  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison gas  
8.2 **49 CFR Class:** 2.3  
8.3 **49 CFR Package Group:** Not pertinent.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
9.2 **Molecular Weight:** 64.06  
9.3 **Boiling Point at 1 atm:** 14°F = -10.0°C = 263.2°K  
9.4 **Freezing Point:** -103.9°F = -75.5°C = 197.7°K  
9.5 **Critical Temperature:** 314.6°F = 157°C = 430.2°K  
9.6 **Critical Pressure:** 1142 psia = 77.69 atm = 7.870 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.45 at -10°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.2  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.265  
9.12 **Latent Heat of Vaporization:** 171 Btu/lb = 94.8 cal/g = 3.97 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -94.1 Btu/lb = -52.3 cal/g = -2.19 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 32.2 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 84 psia

### NOTES

# SULFUR DIOXIDE

SFD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-55	96.509		C		N		N
-50	96.089		U		O		O
-45	95.669		R		T		T
-40	95.259		R		P		P
-35	94.839		E		E		R
-30	94.429		N		R		T
-25	94.009		T		T		I
-20	93.589		L		I		N
-15	93.181		Y		N		E
-10	92.759				E		N
-5	92.339		N				T
0	91.929		O				
5	91.509		T				
10	91.099		A				
			V				
			A				
			I				
			L				
			A				
			B				
			L				
			E				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	10.000	-100	0.293	-100	0.00485	0	0.143
		-90	0.464	-90	0.00749	25	0.145
		-80	0.714	-80	0.01123	50	0.147
		-70	1.071	-70	0.01640	75	0.149
		-60	1.567	-60	0.02340	100	0.151
		-50	2.243	-50	0.03268	125	0.152
		-40	3.147	-40	0.04475	150	0.154
		-30	4.333	-30	0.06019	175	0.156
		-20	5.866	-20	0.07962	200	0.158
		-10	7.817	-10	0.10370	225	0.160
		0	10.270	0	0.13330	250	0.161
		10	13.300	10	0.16900	275	0.163
		20	17.030	20	0.21180	300	0.165
		30	21.540	30	0.26250	325	0.166
		40	26.950	40	0.32190	350	0.168
		50	33.390	50	0.39090	375	0.170
		60	40.970	60	0.47050	400	0.171
						425	0.173
						450	0.174
						475	0.176
						500	0.177
						525	0.179
						550	0.180
						575	0.181
						600	0.183

# SULFOLANE

SFL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sulfolane-W Tetrahydrothiophene-1,1-Dioxide Tetramethylene sulfone		Oily liquid	Colorless	Weak oily odor
		Solidifies and sinks and mixes with water. Freezing point is 79°F.		
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, foam, dry chemical, or carbon dioxide.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Not irritating to skin. Irritating to eyes. Harmful if swallowed. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 39; Sulfolane  
2.2 **Formula:** CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>SO<sub>2</sub>  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 126-33-0  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51579

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Very mildly irritating to the eyes.  
3.3 **Treatment of Exposure:** INGESTION: induce vomiting. SKIN OR EYE CONTACT: flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat, mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 330°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemicals, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic, irritating gases may be generated in fires.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Anhydrous: 99+%; standard water blend: 97% plus 3% water  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 120.17  
9.3 **Boiling Point at 1 atm:** 545°F = 285°C = 558°K  
9.4 **Freezing Point:** 79°F = 26°C = 299°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.26 at 30°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -9,500 Btu/lb = -5,300 cal/g = -220 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -22 Btu/lb = -12 cal/g = -0.5 X 10<sup>3</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SULFOLANE

SFL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
82	78.580	80	0.356		N		N
84	78.549	100	0.363		O		O
86	78.530	120	0.369		T		T
88	78.500	140	0.376				
90	78.469	160	0.383		P		P
92	78.440	180	0.389		E		E
94	78.419	200	0.396		R		R
96	78.389	220	0.403		T		T
98	78.360	240	0.409		I		I
100	78.330	260	0.416		N		N
102	78.299	280	0.423		E		E
104	78.280	300	0.429		N		N
106	78.250	320	0.436		T		T
108	78.219	340	0.443				
110	78.190	360	0.449				
112	78.169	380	0.456				
114	78.139						
116	78.110						
118	78.080						
120	78.059						
122	78.030						
124	78.000						
126	77.969						
128	77.940						
130	77.919						
132	77.889						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	220	0.038	220	0.00062		N
	I	230	0.049	230	0.00080		O
	S	240	0.064	240	0.00103		T
	C	250	0.083	250	0.00131		
	I	260	0.106	260	0.00165		P
	B	270	0.135	270	0.00207		E
	L	280	0.171	280	0.00259		R
	E	290	0.215	290	0.00321		T
		300	0.269	300	0.00396		I
		310	0.334	310	0.00486		N
		320	0.413	320	0.00592		E
		330	0.507	330	0.00719		N
		340	0.620	340	0.00868		T
		350	0.754	350	0.01043		
		360	0.913	360	0.01247		
		370	1.101	370	0.01485		
		380	1.321	380	0.01761		
		390	1.578	390	0.02079		
		400	1.877	400	0.02444		
		410	2.224	410	0.02863		
		420	2.626	420	0.03342		
		430	3.088	430	0.03886		
		440	3.619	440	0.04503		
		450	4.226	450	0.05201		
		460	4.919	460	0.05987		
		470	5.706	470	0.06871		

# SULFUR MONOCHLORIDE

SFM

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Oily liquid	Yellow to red	Irritating sharp odor
	Mixes and reacts with water. Poisonous vapor is produced.		
Evacuate. Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
Fire	Combustible. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, or carbon dioxide. Cool exposed containers with water. Water reacts violently with compound.		
Exposure	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes. Poisonous if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Poisonous if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse dissolved material  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material  
Pump or dredge contaminated sediment

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: S<sub>2</sub>Cl<sub>2</sub>  
2.3 IMO/UN Designation: 8.0/1828  
2.4 DOT ID No.: 1828  
2.5 CAS Registry No.: 12771-08-3  
2.6 NAERG Guide No.: 137  
2.7 Standard Industrial Trade Classification: 52241

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles and/or face shield; canister-type gas mask (light concentrations) or self-contained breathing apparatus (heavy concentrations); chemically resistant shoes or boots, apron, and long-sleeve gloves.
- 3.2 **Symptoms Following Exposure:** Vapors irritate eyes and respiratory system; pulmonary edema may result. Liquid burns and damages eyes. Unless removed at once, it burns the skin. Ingestion causes severe damage to mouth and stomach.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; use artificial respiration and oxygen if required; call a doctor. INGESTION: give water; do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min.; obtain medical attention at once. SKIN: flush with water; remove contaminated clothing under shower.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 1 ppm  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second-and third degree burns on short contact and is very injurious to the eyes.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 5 ppm  
3.14 OSHA PEL-TWA: 1 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 266°F O.C. 245°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, water spray  
4.4 Fire Extinguishing Agents Not to Be Used: Water reacts violently with compound.  
4.5 Special Hazards of Combustion Products: Toxic and corrosive fumes are evolved when heated.  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 453°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts violently with water to produce heat and hydrogen chloride fumes. The solution is strongly acid.  
5.2 Reactivity with Common Materials: The liquid dissolves rubber and plastics. After reaction with water, the strong acid formed attacks metals, generating flammable hydrogen gas.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: After reaction with water, the acid formed can be neutralized with lime or soda ash.  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial material may contain 0-5% free sulfur.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  
Category Classification  
Health Hazard (Blue)..... 2  
Flammability (Red)..... 1  
Instability (Yellow)..... 1  
8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 135.03  
9.3 Boiling Point at 1 atm: 280°F = 138°C = 411°K  
9.4 Freezing Point: -112°F = -80°C = 193°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.68 at 20°C (liquid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.129  
9.12 Latent Heat of Vaporization: 115 Btu/lb = 63.8 cal/g = 2.67 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: -502.2 Btu/lb = -279.0 cal/g = 11.67 X 10<sup>5</sup> J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# SULFUR MONOCHLORIDE

SFM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	106.599	35	0.220		N		N
40	106.299	40	0.220		O		O
45	106.000	45	0.220		T		T
50	105.700	50	0.220				
55	105.500	55	0.220		P		P
60	105.200	60	0.220		E		E
65	104.900	65	0.220		R		R
70	104.599	70	0.220		T		T
75	104.400	75	0.220		I		I
80	104.099	80	0.220		N		N
85	103.799	85	0.220		E		E
90	103.500	90	0.220		N		N
95	103.200	95	0.220		T		T
100	103.000	100	0.220				
105	102.700	105	0.220				
110	102.400	110	0.220				
115	102.099	115	0.220				
120	101.900	120	0.220				
		125	0.220				
		130	0.220				
		135	0.220				
		140	0.220				
		145	0.220				
		150	0.220				
		155	0.220				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	40	0.093	40	0.00235	0	0.125
	E	50	0.127	50	0.00313	20	0.126
	A	60	0.170	60	0.00411	40	0.127
	C	70	0.226	70	0.00536	60	0.128
	T	80	0.296	80	0.00690	80	0.129
	S	90	0.385	90	0.00882	100	0.130
		100	0.496	100	0.01115	120	0.131
		110	0.634	110	0.01399	140	0.132
		120	0.802	120	0.01741	160	0.133
		130	1.007	130	0.02149	180	0.133
		140	1.256	140	0.02634	200	0.134
		150	1.554	150	0.03206	220	0.135
		160	1.910	160	0.03877	240	0.135
		170	2.332	170	0.04658	260	0.136
		180	2.829	180	0.05564	280	0.137
		190	3.413	190	0.06608	300	0.137
		200	4.093	200	0.07805	320	0.138
		210	4.883	210	0.09171	340	0.138
		220	5.794	220	0.10720	360	0.138
		230	6.842	230	0.12480	380	0.139
		240	8.040	240	0.14460	400	0.139
		250	9.406	250	0.16670	420	0.139
		260	10.960	260	0.19150	440	0.140
		270	12.710	270	0.21910	460	0.140
		280	14.680	280	0.24970	480	0.140
						500	0.140

# SODIUM SILICOFLUORIDE

SFR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Salufer Sodium fluosilicate Sodium hexafluorosilicate	Solid  White  Odorless  Sinks in water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing, or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Will burn skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: Na<sub>2</sub>SiF<sub>6</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2674
- 2.5 CAS Registry No.: 1310-02-7
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; goggles or face shield; protective gloves
- 3.2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Ingestion causes symptoms similar to fluoride poisoning; compound is highly toxic; initial symptoms include nausea, cramps, vomiting, diarrhea, and dehydration; in severe cases, convulsions, shock, and cyanosis are followed by death in 2-4 hr. Contact with eyes causes irritation. Contact with skin causes rash, redness, and burning, sometimes followed by ulcer formation.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: seek medical attention; administer gastric lavage with lime water, then give lime water or milk at frequent intervals. EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50-500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Decomposes at red heat
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 98+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 188
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.68 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM SILICOFLUORIDE

SFR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.413		N		N		N
36	0.427		O		O		O
38	0.440		T		T		T
40	0.453						
42	0.467		P		P		P
44	0.480		E		E		E
46	0.493		R		R		R
48	0.507		T		T		T
50	0.520		I		I		I
52	0.533		N		N		N
54	0.547		E		E		E
56	0.560		N		N		N
58	0.573		T		T		T
60	0.587						
62	0.600						
64	0.613						
66	0.627						
68	0.640						
70	0.653						
72	0.667						
74	0.680						
76	0.693						
78	0.707						
80	0.720						
82	0.733						
84	0.747						



# SODIUM HYPOCHLORITE

SHC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Liquid bleach	Watery liquid  Sinks and mixes with water.	Green to yellow  Bleaching liquid odor
Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable. Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	Harmful to aquatic life in very low concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: NaOCl-H<sub>2</sub>O
- 2.3 IMO/UN Designation: 8.0/1791
- 2.4 DOT ID No.: 3212
- 2.5 CAS Registry No.: 7681-52-9
- 2.6 NAERG Guide No.: 140
- 2.7 Standard Industrial Trade Classification: 52331

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; goggles.
- 3.2 **Symptoms Following Exposure:** Liquid can be irritating to skin and eyes if contact is maintained.
- 3.3 **Treatment of Exposure:** INGESTION: induce vomiting, give water, and repeat. SKIN: wash off contacted skin area. EYES: flush with plenty of water for 15 min. and consult a physician.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; oral rat LD<sub>50</sub> = 8.91 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Slight irritation of eyes and mucous membranes.
- 3.11 **Liquid or Solid Characteristics:** Irritates eyes and skin on prolonged contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** May decompose, generating irritating chlorine gas.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Destroy with sodium bisulfite or hypo and water, then neutralize with soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Several grades and concentrations, typified by ordinary household bleach.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not applicable
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.06 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** (est.) -90 Btu/lb = -50 cal/g = -2 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM HYPOCHLORITE

SHC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	66.169	42	0.908		N		N
44	66.169	44	0.908		O		O
46	66.169	46	0.908		T		T
48	66.169	48	0.908				
50	66.169	50	0.908		P		P
52	66.169	52	0.908		E		E
54	66.169	54	0.908		R		R
56	66.169	56	0.908		T		T
58	66.169	58	0.908		I		I
60	66.169	60	0.908		N		N
62	66.169	62	0.908		E		E
64	66.169	64	0.908		N		N
66	66.169	66	0.908		T		T
68	66.169	68	0.908				
70	66.169	70	0.908				
72	66.169	72	0.908				
74	66.169	74	0.908				
76	66.169	76	0.908				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM HYDROXIDE

SHD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Caustic soda Lye	Solid flakes or pellets    White    Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. Flammable gas may be produced on contact with metals. Wear rubber overclothing (including gloves). Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. IF IN EYES, hold eyelids open and flush with plenty of water.  SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 5; Caustics  
2.2 Formula: NaOH  
2.3 IMO/UN Designation: 8.0/1823  
2.4 DOT ID No.: 1823  
2.5 CAS Registry No.: 1310-73-2  
2.6 NAERG Guide No.: 154  
2.7 Standard Industrial Trade Classification: 52262

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles; face shield; filter or dust-type respirator; rubber boots; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Strong corrosive action on contacted tissues. INHALATION: dust may cause damage to upper respiratory tract and lung itself, producing from mild nose irritation to pneumonitis. INGESTION: severe damage to mucous membranes; severe scar formation or perforation may occur. EYE CONTACT: produces severe damage.
- 3.3 **Treatment of Exposure:** INHALATION: remove from exposure; support respiration; call physician. INGESTION: give water or milk followed by dilute vinegar or fruit juice; do NOT induce vomiting. SKIN: wash immediately with large quantities of water under emergency safety shower while removing clothing; continue washing until medical help arrives; call physician. EYES: irrigate immediately with copious amounts of water for at least 15 min.; call physician.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 2 mg/m<sup>3</sup>  
3.7 **Toxicity by Ingestion:** (10% solution) oral rabbit LD<sub>50</sub> = 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Non-volatile  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 10 mg/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 2 mg/m<sup>3</sup>  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves with liberation of much heat; may steam and splatter
- 5.2 **Reactivity with Common Materials:**  
When wet, attacks metals such as aluminum, tin, lead, and zinc to produce flammable hydrogen gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute acetic acid
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
125 ppm/96 hr/mosquito fish/TL<sub>50</sub>/fresh water  
180 ppm/23 hr/oysters/lethal/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical flakes; USP pellets
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 1              |
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 40.00
- 9.3 **Boiling Point at 1 atm:** Very high
- 9.4 **Freezing Point:** 604°F = 318°C = 591°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.13 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 50.0 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM HYDROXIDE

SHD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	44.810		N		N		N
36	47.660		O		O		O
38	50.500		T		T		T
40	53.350						
42	56.190		P		P		P
44	59.040		E		E		E
46	61.880		R		R		R
48	64.719		T		T		T
50	67.570		I		I		I
52	70.410		N		N		N
54	73.259		E		E		E
56	76.099		N		N		N
58	78.950		E		E		E
60	81.790		N		N		N
62	84.639		T		T		T
64	87.480						
66	90.320						
68	93.169						
70	96.009						
72	98.860						
74	101.700						
76	104.500						
78	107.400						
80	110.200						
82	113.099						
84	115.900						

# SODIUM HYPOCHLORITE SOLUTION

SHP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bleach Clorox Javelle water	Water liquid  Colorless or slightly yellow  Household bleach  Mixes with water.
<b>Keep people away.</b> <b>Avoid contact with liquid.</b> <b>Wear goggles and self-contained breathing apparatus.</b> <b>Wear rubber gloves, plastic overalls and boots.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not Flammable. May cause fire on contact with organic material. POISONOUS GASES ARE PRODUCED WHEN HEATED. Cool exposed containers with water. Wear goggles and self-contained breathing apparatus. Extinguish with water, foam, dry chemical or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air.  LIQUID Irritating to eyes and skin. Harmful if swallowed. Remove contaminated clothing and shoes. Wash affected skin area. IF IN EYES flush with plenty of water for 15 minutes. IF SWALLOWED and victim is CONSCIOUS, have victim drink either milk or milk of magnesia (1 oz.)
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 5; Caustics
- 2.2 Formula: NaClO
- 2.3 IMO/UN Designation: 8.0/1791
- 2.4 DOT ID No.: 1791
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52331

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, goggles, self-contained breathing apparatus, plastic coveralls and boots.
- 3.2 **Symptoms Following Exposure:** INHALATION: Will produce severe bronchial irritation and pulmonary edema. INGESTION: burning of mouth, nausea and vomiting, delirium, coma. EYES & SKIN: can be irritating if contact is maintained.
- 3.3 **Treatment of Exposure:** INHALATION: Sips of milk or other demulcent. EYES: Flush with plenty of water for 15 minutes. SKIN: Wash contaminated area with soap and water. INGESTION: Induce vomiting, give water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** LD50 intraperitoneal mouse 1.58 g/kg The 96 hour LC50 for fathead minnows is 8ppm.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Esophageal stricture is often mentioned as a possible latent complication of hypochlorite poisoning.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable.
- 4.3 **Fire Extinguishing Agents:** Chemical, CO<sub>2</sub>, foam, or water in flooding quantities.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Amines and oxidizable material such as oxalic acid. May produce explosive chloramines with amines.
- 4.5 **Special Hazards of Combustion Products:** Store in a cool, dark place, away from combustible materials. Emits chlorine gas when burned.
- 4.6 **Behavior in Fire:** May decompose, generating irritating chlorine gas.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Not pertinent
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Not pertinent
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Unstable in air unless mixed with sodium hydroxide. Reacts with amines to form normal chloramines, which are explosive.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Sodium disulfite; hypo isulfite.
- 5.5 **Polymerization:** Will not occur
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
At 0.02 ppm residual Cl - 50% inhibition of phytoplankton growth  
500 mg/l/96hr/LC<sub>50</sub> fresh and salt/fathead minnows and grass shrimp.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Negative. Unlikely to accumulate in the food chain.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 211  
Human Oral hazard: 2  
Human Contact hazard: II/I  
Reduction of amenities: XX/X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Many Grades
- 7.2 **Storage Temperature:** Cool
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II or III depending upon available chlorine.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 74.44
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.093 for 5% solution
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Data not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM HYPOCHLORITE SOLUTION

SHP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
32	29.300		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# SODIUM HYDROSULFIDE SOLUTION

SHR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sodium bisulfide Sodium hydrogen sulfide Sodium sulphydrate	Liquid  Light yellow to red  Rotten egg odor  Mixes with water.
Keep people away. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 5; Caustic
- 2.2 Formula: NaSH-H<sub>2</sub>O
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2922
- 2.5 CAS Registry No.: 16721-80-5
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52342

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber protective equipment, such as apron, boots, splash-proof goggles, gloves; canister-type respirator or self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** Inhalation of mist causes irritation of respiratory tract and possible systemic poisoning; hydrogen sulfide gas, which may be given off when acid is present, causes headache, dizziness, nausea, vomiting; continued exposure can lead to loss of consciousness, respiratory failure, and death. Liquid causes marked eye irritation; itching, lachrymation, swelling, and corneal injury causing blurring of vision are the most common effects; exposure to light may increase the painful effects. Contact of liquid with skin causes irritation and corrosion of tissue; continued exposure may cause dermatitis. Ingestion causes severe burning and corrosion of all portions of the gastro-intestinal tract, pain in the throat and abdomen, nausea, and vomiting, followed by diarrhea. In severe cases, collapse, unconsciousness, and paralysis of respiration may be expected.
- 3.3 **Treatment of Exposure:** INHALATION: move victim from contaminated atmosphere; call physician; if breathing has ceased, start mouth-to-mouth resuscitation. EYES: immediately flush with large quantities of running water for a minimum of 15 min.; obtain medical attention as soon as possible; while awaiting instructions from physician, patient may be kept in a dark room and ice compresses applied to the eyes and forehead. SKIN: immediately flush affected areas with water; obtain medical attention if irritation persists. INGESTION: obtain medical attention as soon as possible; if patient is conscious, induce vomiting by giving large amounts of water or warm salty water (2 tablespoons of table salt to a pint of water); if this measure is unsuccessful, vomiting may be induced by tickling back of patient's throat with a finger. Vomiting should be encouraged until the vomitus is clear. If patient is unconscious, do not give anything but ensure there is no obstruction to breathing (his tongue should be kept forward and false teeth removed). He will be less likely to aspirate vomitus if he is placed in a face-down position.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 0.5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** 0.0047 ppm
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Corrodes most metals, but reaction is not hazardous.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flood with water.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
206 mg/1/96 hr/mosquito fish/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 45% or less
- 7.2 **Storage Temperature:** >63°F
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** (approx.) 212°F = 100°C = 373°K
- 9.4 **Freezing Point:** (approx.) 63°F = 17°C = 290°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.3 at 15°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.95 psia

### NOTES

# SODIUM HYDROSULFIDE SOLUTION

SHR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
63	81.320		C		C		C
64	81.290		U		U		U
65	81.250		R		R		R
66	81.219		R		R		R
67	81.179		E		E		E
68	81.150		N		N		N
69	81.110		T		T		T
70	81.080		L		L		L
71	81.040		Y		Y		Y
72	81.009						
73	80.980		N		N		N
74	80.940		O		O		O
75	80.910		T		T		T
76	80.870						
77	80.839		A		A		A
78	80.799		V		V		V
79	80.770		A		A		A
80	80.730		I		I		I
81	80.700		L		L		L
82	80.660		A		A		A
83	80.629		B		B		B
84	80.591		L		L		L
85	80.559		E		E		E
86	80.520						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y		C U R R E N T L Y		C U R R E N T L Y		C U R R E N T L Y
	N O T		N O T		N O T		N O T
	A V A I L A B L E		A V A I L A B L E		A V A I L A B L E		A V A I L A B L E



# SODIUM HYDROGEN SULFITE SOLUTION (35% OR LESS)

SHX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sodium bisulfite solution	Liquid	Pale yellow	Pungent odor of sulfur dioxide
<b>Wear chemical splash goggles and rubber gloves.</b> <b>Restrict access.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Not flammable. Use extinguishing agents appropriate for the surrounding fire. Cool exposed containers with water spray.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 43;  
Miscellaneous Water Solutions  
2.2 **Formula:** NaHSO<sub>3</sub>·H<sub>2</sub>O  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** 2693  
2.5 **CAS Registry No.:** 7631-90-5  
2.6 **NAERG Guide No.:** 154  
2.7 **Standard Industrial Trade Classification:** 52344

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear chemical splash goggles or face shield and chemical protective gloves.  
3.2 **Symptoms Following Exposure:** Solution is irritating to eyes, nose, and throat and can irritate skin. Ingestion may cause irritation of stomach.  
3.3 **Treatment of Exposure:** Get medical attention. SKIN: wash with plenty of water. EYES: flush with plenty of water for at least 15 minutes.  
3.4 **TLV-TWA:** 5 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 2.0 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable.  
4.2 **Flammable Limits in Air:** Not pertinent.  
4.3 **Fire Extinguishing Agents:** Use extinguishing agents appropriate for the surrounding fire.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.  
4.5 **Special Hazards of Combustion Products:** Decomposes with heat or oxidizing agents, releasing sulfur dioxide gas.  
4.6 **Behavior in Fire:** Not pertinent.  
4.7 **Auto Ignition Temperature:** Not pertinent.  
4.8 **Electrical Hazards:** Not pertinent.  
4.9 **Burning Rate:** Not pertinent.  
4.10 **Adiabatic Flame Temperature:** Not pertinent.  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Not pertinent.  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Not compatible with oxidizing agents.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
240 ppm/24, 48, & 96 hr/mosquito fish/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Reacts chemically with dissolved oxygen even in absence of seeded organisms.  
6.4 **Food Chain Concentration Potential:**  
None.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical and photographic grades.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Open.  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive Material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 104.06  
9.3 **Boiling Point at 1 atm:** >212°F = >100°C = >373°K  
9.4 **Freezing Point:** <32°F = <0°C = <273°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.36 at 25°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 2.2  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM HYDROGEN SULFITE SOLUTION (35% OR LESS)

SHX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	11.350		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	100	1.509	100	0.02612		C U R R E N T L Y  N O T  A V A I L A B L E

# SALICYLIC ACID

SLA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> o-Hydroxybenzoic acid Retarder W	Solid  White to light tan  Odorless  Sinks and mixes slowly with water.
Keep people away. Avoid contact with solid and dust. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible Dust cloud may explode if ignited in an enclosed area. Irritating gases may be produced when heated. Extinguish with dry chemicals or carbon dioxide. Water and foam may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 1, 2-HOC<sub>6</sub>H<sub>4</sub>COOH  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 69-72-7  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51393

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Gloves; goggles; respirator for dust; clean body-covering clothing  
3.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Vomiting may occur spontaneously if large amounts are swallowed. Contact with eyes causes irritation, marked pain, and corneal injury which should heal. Prolonged or repeated skin contact may cause marked irritation or even a mild burn.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: induce vomiting and get medical attention promptly. EYES: promptly flush with water for 15 min. and get medical attention. SKIN: wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors of unburned material and phenol may form in fire.  
4.6 **Behavior in Fire:** Sublimes and forms vapor or dust that may explode  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 15.8%; CO<sub>2</sub> diluent: 17.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1,450 ppm/48 hr/daphnia/threshold for immob./fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
141%, 5 days  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 98+%; Pure, 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 138.13  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** 315°F = 157°C = 430°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.44 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -9,420 Btu/lb = -5,230 cal/g = -219 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SALICYLIC ACID

SLA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.200		N		N		N
36	0.200		O		O		O
38	0.200		T		T		T
40	0.200						
42	0.200		P		P		P
44	0.200		E		E		E
46	0.200		R		R		R
48	0.200		T		T		T
50	0.200		I		I		I
52	0.200		N		N		N
54	0.200		E		E		E
56	0.200		N		N		N
58	0.200		E		E		E
60	0.200		N		N		N
62	0.200		T		T		T
64	0.200						
66	0.200						
68	0.200						
70	0.200						
72	0.200						
74	0.200						
76	0.200						
78	0.200						
80	0.200						
82	0.200						
84	0.200						

# SELENIUM DIOXIDE

SLD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Selenious anhydride Selenium oxide	Solid  White  Sour odor  Sinks and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear goggles, dust respirator, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause coughing, nausea, or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: SeO<sub>2</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2811
- 2.5 CAS Registry No.: 7446-08-4
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52239

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** This compound is highly toxic if inhaled or ingested. Dust mask; rubber gloves; protective clothing
- 3.2 **Symptoms Following Exposure:** Absorption of selenium may be demonstrated by presence of the element in the urine and by a garlic-like odor of the breath. Inhalation of dust can cause bronchial spasms, symptoms of asphyxiation, and pneumonitis. Acute symptoms of ingestion include sternal pain, cough, nausea, pallor, coated tongue, gastrointestinal disorders, nervousness, and conjunctivitis. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** Consult physician after all exposures to this compound. INHALATION: remove victim to fresh air; give oxygen if needed. INGESTION: induce vomiting; follow with gastric lavage and saline cathartics. EYES: flush immediately and thoroughly with water. SKIN: flush with water.
- 3.4 **TLV-TWA:** 0.2 mg/m<sup>3</sup> (as selenium)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** 0.0002 mg/m<sup>3</sup>
- 3.13 **IDLH Value:** 1 mg Se/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 0.2 mg Se/m<sup>3</sup>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Currently not available
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Sublimes and forms toxic vapors when heated in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** In presence of water will corrode most metals
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
12 ppm/7 days/goldfish/TL<sub>m</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: (3)  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 99.5+%
- 7.2 **Storage Temperature:** Cool ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** U204
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 111
- 9.3 **Boiling Point at 1 atm:** (sublimes) 599°F = 315°C = 583°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 3.95 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** 12.1 Btu/lb = 6.7 cal/g = 0.28 X 10<sup>6</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SELENIUM DIOXIDE

SLD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	198.400	160	0.245	160	0.00408		N O T
36	201.900	170	0.263	170	0.00432		
38	205.299	180	0.283	180	0.00457		
40	208.799	190	0.303	190	0.00482		
42	212.199	200	0.324	200	0.00508		P
44	215.699	210	0.346	210	0.00534		E
46	219.099	220	0.369	220	0.00561		R
48	222.500	230	0.392	230	0.00588		T
50	226.000	240	0.416	240	0.00615		I
52	229.400	250	0.441	250	0.00642		N
54	232.900	260	0.466	260	0.00670		E
56	236.299	270	0.493	270	0.00698		N
58	239.799	280	0.520	280	0.00727		T
60	243.199	290	0.547	290	0.00755		
62	246.699	300	0.576	300	0.00784		
64	250.099	310	0.605	310	0.00813		
66	253.500	320	0.635	320	0.00842		
68	257.000	330	0.665	330	0.00871		
70	260.399	340	0.696	340	0.00900		
72	263.899	350	0.728	350	0.00929		
74	267.299						
76	270.799						
78	274.199						
80	277.699						
82	281.099						
84	284.500						

# SODIUM 2-MERCAPTOBENZOTHAZOL SOLUTION

SMB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Benzothiazolethiol, sodium salt 2-(3h)-Benzothiazolethione, sodium salt Duodex Nacap Sodium 2-benzothiazolethioate	50% aqueous solution  Amber  Old rubber  Sinks and Mixes.
<b>Keep people away. Avoid contact with liquid or spray.</b> <b>Wear self-contained positive pressure breathing apparatus and full protective clothing.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	VERY TOXIC FUMES EMITTED WHEN HEATED TO DECOMPOSITION. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish with water spray, carbon dioxide, dry chemicals, foam.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID May cause irreversible damage to eyes or skin. Large amount on skin may cause severe depression and/or death. If swallowed may cause tremors, convulsions, severe depression, hematuria or death. Remove and isolate contaminated clothing and shoes at the site. Wash contaminated areas with soap and running water. IF IN EYES OR ON SKIN, flush with running water for at least 15 min.; hold eyelids open if necessary. Clean skin with soap and water. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing but keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_6H_4SC(SNa)_n$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 2492-26-4
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** For spills of aqueous solutions-wear splash-proof goggles, respirator, and protective rubber clothing. Firefighters should wear full protective clothing and self-contained positive pressure breathing apparatus.
- 3.2 **Symptoms Following Exposure:** Contact with moisture in the body by inhalation may yield sodium hydroxide (corrosive) and 2-mercaptobenzothiazole, an irritant. Contact with the eyes caused opacity or ulceration of the cornea, inflammation of the iris, redness and swelling of the conjunctiva and partial eversion of the eye lids, and destruction or irreversible tissue change in 24 hours or less (rabbit). A dose of 2,500 mg/kg applied to the skin caused severe depression, cold extremities, appetite loss; 4 of 10 died. Exposure of the skin to 1,250 mg/kg caused a severe degree of skin injury. The skin was burned in 24 hours with formation of hard eschar at 1-2 weeks; 1 of 10 rabbits died. Ingestion caused tremors, convulsions, severe depression and hematuria in male rats; ingestion of 312.5 mg/kg: 1 of 5 male rats die on day 2; 625 mg/kg: 2 of 5 died within 3-5 minutes; 1,250 mg/kg: 3 of 5 died within 3-5 minutes; 2,500 mg/kg: 100% mortality within 3-5 minutes. Hemorrhage of the stomach occurred in all rats that died.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush eyes with large quantity of fresh running water for at least 15 minutes; hold eyelids open if necessary. SKIN: Wash with soap and running water; remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. INGESTION: If victim is unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $LD_{50} = 3.12$  g/kg (rat)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: A 50% solution in water caused a severe degree of skin injury and destruction or irreversible eye damage in 24 hours or less. (rabbit)
- 3.12 Odor Threshold: 16 ppm
- 3.13 IDLH Value: Not pertinent
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent
- 4.2 Flammable Limits in Air: Not pertinent
- 4.3 Fire Extinguishing Agents: Water spray, carbon dioxide, dry chemicals, foam on nearby fires.
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Contain very toxic fumes of SOx, NOx, and Na<sub>2</sub>O.
- 4.6 Behavior in Fire: May decompose at elevated temperatures to yield toxic fumes.
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Not pertinent
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Not pertinent.
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Concentrated aqueous solutions are corrosive.
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: Slight
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 50% aqueous solution
- 7.2 Storage Temperature: Not listed
- 7.3 Inert Atmosphere: Not listed
- 7.4 Venting: Not listed
- 7.5 IMO Pollution Category: B
- 7.6 Ship Type: 3
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: Not pertinent
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Currently not available
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.255 at 25°C
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# SODIUM 2-MERCAPTOBENZOTHAZOL SOLUTION

SMB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# SODIUM METHYLATE

SML

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sodium methoxide	Solid  White  Odorless  Mixes with water.
Keep people away. Avoid contact with solid and dust. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. Flood discharge area with water. Extinguish with dry chemicals or carbon dioxide.
<b>Exposure</b>	Call for medical aid. DUST Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Chemical and Physical Treatment: Burn; Neutralize	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: CH <sub>3</sub> ONa 2.3 IMO/UN Designation: 4.3/1431 2.4 DOT ID No.: 1431 2.5 CAS Registry No.: 124-41-4 2.6 NAERG Guide No.: 138 2.7 Standard Industrial Trade Classification: 51550
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus; rubber gloves and apron; goggles or face shield. 3.2 <b>Symptoms Following Exposure:</b> Inhalation of dust causes severe irritation of nose and throat. Contact with eyes or skin causes severe irritation and burns. Ingestion causes irritation of mouth and stomach. 3.3 <b>Treatment of Exposure:</b> Get medical attention at once following all exposures to this compound. INHALATION: remove victim from contamination and keep him quiet and warm. Rest is essential. Hot tea or coffee may be given as a stimulant if patient is conscious. If breathing has apparently ceased, give artificial respiration. If available, oxygen should be administered by experienced personnel. EYES: wash well with water, then with 3% boric acid solution and additional water washes. SKIN: wash well with water, then with dilute vinegar. INGESTION: if victim is conscious, induce vomiting by administering a glassful of warm water containing a teaspoon full of salt; repeat until vomit is clear, then give two teaspoons of baking soda every 15 min.; keep victim's eyes covered until all visual and retinal changes have disappeared; alert physician to possibility of methyl alcohol poisoning. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Currently not available. 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Odorless 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent (flammable solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, inert powders such as sand or limestone, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Contact with water or foam applied to adjacent fires will produce flammable methanol.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Produces a caustic soda solution and a solution of methyl alcohol. The reaction is not violent.  
5.2 **Reactivity with Common Materials:** Attacks certain plastics such as nylon and polyesters  
5.3 **Stability During Transport:** Stable if dry  
5.4 **Neutralizing Agents for Acids and Caustics:** Water, followed by dilute acetic acid or vinegar  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Padded, dry nitrogen  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Spontaneously Combustible  
8.2 **49 CFR Class:** 4.2  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 54.0  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** >1 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# SODIUM METHYLATE

SML

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E   R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM NITRITE SOLUTION

SNI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Sodium nitrite liquor	Liquid	Pale yellow	Odorless
<b>Keep people away. Avoid contact with eyes and skin.</b> <b>Wear impervious protective clothing and goggles.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Not flammable. Strong oxidizer when water is removed. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self contained breathing apparatus. Flood discharge area with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to eyes, nose and throat. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 5; Caustics
- 2.2 Formula:  $\text{NaNO}_2$
- 2.3 IMO/UN Designation: Not listed.
- 2.4 DOT ID No.: Not listed.
- 2.5 CAS Registry No.: 7632-00-0
- 2.6 NAERG Guide No.: Not listed.
- 2.7 Standard Industrial Trade Classification: 52351

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear impervious protective clothing and goggles.
- 3.2 **Symptoms Following Exposure:** Ingestion (or inhalation of large amounts) causes poisoning which may produce cyanosis, marked fall in blood pressure, leading to collapse, coma, and possibly death. Irritating to skin, eyes, and respiratory tract.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Give patient 2 to 4 glasses of water and induce vomiting. EYES or SKIN: Flush with water, holding lids open occasionally if necessary.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50} = 80\text{-}185 \text{ mg/kg (rat)}$
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable, but may intensify fire.
- 4.2 **Flammable Limits in Air:** Not pertinent.
- 4.3 **Fire Extinguishing Agents:** Apply plenty of water to adjacent fires. Cool exposed containers with water.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use ammonium phosphate dry chemical.
- 4.5 **Special Hazards of Combustion**  
**Products:** Toxic oxides of nitrogen may form in fires.
- 4.6 **Behavior in Fire:** May increase intensity of fire if water evaporates.
- 4.7 **Auto Ignition Temperature:** Not pertinent.
- 4.8 **Electrical Hazards:** Not pertinent.
- 4.9 **Burning Rate:** Not pertinent.
- 4.10 **Adiabatic Flame Temperature:** Not pertinent.
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Not pertinent.
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Incompatible with acids, ammonium salts, amines, cyanides, and reducing agents.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grade solutions of varying concentrations.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Open.
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 69
- 9.3 **Boiling Point at 1 atm:**  $239^\circ\text{F} = 115^\circ\text{C} = 388^\circ\text{K}$
- 9.4 **Freezing Point:**  $30^\circ\text{F} = -1^\circ\text{C} = 272^\circ\text{K}$
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.32 at  $16^\circ\text{C}$  (solid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** <1
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM NITRITE SOLUTION

SNI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	11.020		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	77 100	1.122 1.818	77 100	0.01343 0.02088		C U R R E N T L Y  N O T  A V A I L A B L E

# SODIUM NITRITE

SNT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ecinitrit Filmerine	Solid  White  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. May cause fire on contact with combustibles. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self contained breathing apparatus. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause headache, difficult breathing, or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. If swallowed will cause headache, nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{NaNO}_2$
- 2.3 IMO/UN Designation: 5.1/1500
- 2.4 DOT ID No.: 1500
- 2.5 CAS Registry No.: 7632-00-0
- 2.6 NAERG Guide No.: 140
- 2.7 Standard Industrial Trade Classification: 52351

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves
- 3.2 **Symptoms Following Exposure:** Ingestion (or inhalation of excessive amounts of dust) causes rapid drop in blood pressure, persistent and throbbing headache, vertigo, palpitations, and visual disturbances; skin becomes flushed and sweaty, later cold and cyanotic; other symptoms include nausea, vomiting, diarrhea (sometimes), fainting, methemoglobinemia. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air; if exposure is severe, get medical attention. INGESTION: keep patient recumbent in a shock position and comfortably warm; administer gastric lavage; consult a physician. EYES or SKIN: flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 50-500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable, but may intensify fire
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Apply plenty of water to adjacent fires. Cool exposed containers with water.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires.
- 4.6 **Behavior in Fire:** May increase intensity of fire if in contact with combustible material. May melt and flow at elevated temperatures.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Cautics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
17.1 ppm/24 hr/minnow/no effect/fresh water  
7.5 ppm/48 hr/mosquitofish/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** USP; Reagent
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 69
- 9.3 **Boiling Point at 1 atm:** (decomposes)  
>608°F = >320°C = >593°K
- 9.4 **Freezing Point:** 520°F = 271°C = 544°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.17 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM NITRITE

SNT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	77.919		N		N		N
36	78.240		O		O		O
38	78.570		T		T		T
40	78.889						
42	79.209		P		P		P
44	79.530		E		E		E
46	79.849		R		R		R
48	80.179		T		T		T
50	80.500		I		I		I
52	80.820		N		N		N
54	81.139		E		E		E
56	81.469		N		N		N
58	81.790		E		E		E
60	82.110		N		N		N
62	82.429		T		T		T
64	82.750						
66	83.080						
68	83.400						
70	83.719						
72	84.040						
74	84.370						
76	84.690						
78	85.009						
80	85.330						
82	85.650						
84	85.980						

# SODIUM OXALATE

SOX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethanedioic acid, disodium salt	Solid	White	Odorless
Sinks and mixes slowly with water.			
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: Na<sub>2</sub>C<sub>2</sub>O<sub>4</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 62-76-0
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; rubber gloves
- 3.2 **Symptoms Following Exposure:** Inhalation or ingestion causes pain in throat, esophagus, and stomach; mucous membranes turn white; other symptoms include vomiting, severe purging, weak pulse, cardiovascular collapse, neuromuscular symptoms, and kidney damage. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** Act promptly] INHALATION: move to fresh air; if exposure to dust is severe, get medical attention. INGESTION: give dilute calcium lactate, lime water, or milk; administer gastric lavage; consult physician; watch for edema of the glottis and delayed constriction of esophagus. EYES or SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50-500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1,350 ppm/48 hr/mosquitofish/TL<sub>m</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 11%, 5 days
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent; Primary standard grade
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 134.0
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 2.27 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM OXALATE

SOX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	2.761		N		N		N
36	2.802		O		O		O
38	2.843		T		T		T
40	2.884						
42	2.925		P		P		P
44	2.967		E		E		E
46	3.008		R		R		R
48	3.049		T		T		T
50	3.090		I		I		I
52	3.131		N		N		N
54	3.172		E		E		E
56	3.213		N		N		N
58	3.254		E		E		E
60	3.295		N		N		N
62	3.337		T		T		T
64	3.378						
66	3.419						
68	3.460						
70	3.501						
72	3.542						
74	3.583						
76	3.624						
78	3.665						
80	3.707						
82	3.748						
84	3.789						



# SODIUM PENTACHLOROPHENATE

SPC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Phenol, pentachloro-, sodium salt		Solid, beads or powder	Buff colored	Phenolic odor
<b>Wear full covering clothing, chemical protective gloves and goggles. Restrict access. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.</b>				
<b>Fire</b>	Not flammable. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide.			
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. May be fatal if absorbed through skin. Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, drink 1 or 2 glasses of water and induce vomiting.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** C<sub>6</sub>Cl<sub>5</sub>ONa  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** 2567  
2.5 **CAS Registry No.:** 131-52-2  
2.6 **NAERG Guide No.:** 154  
2.7 **Standard Industrial Trade Classification:** 51244

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full covering clothing, chemical protective gloves and goggles. Where dust is present, use approved dust respirator.  
3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat. May cause weakness, excessive sweating, headache, dizziness, nausea, vomiting, and difficulty in breathing.  
3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. INGESTION: Drink 1 or 2 glasses of water and induce vomiting.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent.  
3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable.  
4.2 **Flammable Limits in Air:** Not pertinent.  
4.3 **Fire Extinguishing Agents:** Use dry chemical, alcohol foam, or carbon dioxide on adjacent fires.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as hydrogen chloride, polychlorodibenzodioxins and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Not pertinent.  
4.7 **Auto Ignition Temperature:** Not pertinent.  
4.8 **Electrical Hazards:** Not pertinent.  
4.9 **Burning Rate:** Not pertinent.  
4.10 **Adiabatic Flame Temperature:** Not pertinent.  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Not pertinent.  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Incompatible with strong oxidizing agents.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades, 85-95%.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid.  
9.2 **Molecular Weight:** 288.35  
9.3 **Boiling Point at 1 atm:** Decomposes.  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM PENTACHLOROPHENATE

SPC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM PHOSPHATE, TRIBASIC

SPH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dri-tri Trisodium orthophosphate Trisodium phosphate	Solid, crystals Colorless or white Odorless  Sinks and mixes with water.
<b>Restrict access.</b> <b>Keep people away. AVOID CONTACT WITH SOLID AND DUST.</b> <b>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	NOT FLAMMABLE.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST. Irritating to eyes, nose, throat and skin. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. IF IN EYES, hold eyelids open and flush with plenty of water.  SOLID. Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing or shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:** Na<sub>3</sub>PO<sub>4</sub>
- 2.3 **IMO/UN Designation:** Not listed
- 2.4 **DOT ID No.:** Not listed
- 2.5 **CAS Registry No.:** Currently not available
- 2.6 **NAERG Guide No.:** 171
- 2.7 **Standard Industrial Trade Classification:** 52363

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves and boots, safety goggles or face mask, hooded suit, and respirator with approved canister, or a self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** INHALATION: Will produce local irritation in the respiratory tract. A burning sensation in the nose and throat, as well as coughing (and in high concentrations, choking) may be noted. May cause lung irritation. EYES: Immediate and severe pain followed by conjunctival edema and corneal clouding. Cataracts may form. SKIN: Immediate local reactions, including reddening, itching and irritation, followed by loss of surface layers of the skin. INGESTION: Severe tissue damage to all portions of the gastrointestinal tract. Symptoms include pain and burning wherever contact is made. Nausea, vomiting, cramps, and diarrhea may occur. Tissue corrosion and ulceration may result if untreated.
- 3.3 **Treatment of Exposure:** Get medical aid. INHALATION: Remove from exposure. If needed, give artificial respiration. EYES: Wash with running water for 15 min. Continue irrigation for additional 15 min. if physician is not available. SKIN: Wash with running water. Remove contaminated clothing. INGESTION: Induce vomiting by giving large amounts of water or warm salty water. If this doesn't cause vomiting, induce. Continue until vomitus is clear. Milk, eggs or olive oil may be given for their soothing effect.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 0-15 g/kg.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Use appropriate extinguishing media for suppression of exposure fire.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** At fire temperature decomposes to emit highly toxic and irritating phosphorus oxides.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
151 ppm/96 hr/mosquito fish/TL<sub>m</sub>/Turbid water  
126 ppm/96 hr/daphnia magna/TL<sub>m</sub>.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grade-92% min. Food grade. Reagent Grade. Hydrated. Anhydrous.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 163.95 (anhydrous); 380.16 (Hydrate, 12H<sub>2</sub>O)
- 9.3 **Boiling Point at 1 atm:** The hydrate loses 11 moles of water at 100°C, 212°F, 373.2°K.
- 9.4 **Freezing Point:** 163.94–170.06°F = 73.3–76.7°C = 346.45–349.85°K.
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.62 at 20°C (Hydrate) 2.52 anhydrous
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** hydrate absorbs heat. 75.2 Btu/lb = 40.3 cal/g = 1.69 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM PHOSPHATE, TRIBASIC

SPH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
50 55 60 65 70 75 80 85 90 95 100 105 110 115 120	8.835 9.674 10.593 11.599 12.701 13.907 15.228 16.675 18.259 19.993 21.892 23.971 26.248 28.742 31.472		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM PHOSPHATE

SPP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Disodium dihydrogen pyrophosphate Sodium acid pyrophosphate Sodium phosphate dibasic Sodium phosphate, monobasic Sodium phosphate, tribasic	Solid (powder or granules)      White      Odorless  Sinks and mixes with water.
<b>Restrict access.</b> <b>Keep people away. Avoid contact with solid and dust.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** (1)  $\text{NaH}_2\text{PO}_4$ ; (2)  $\text{Na}_2\text{HPO}_4$ ; (3)  $\text{Na}_3\text{PO}_4$ ; (4)  $\text{Na}_2\text{H}_2\text{P}_2\text{O}_7$ ; (5)  $\text{Na}_4\text{P}_2\text{O}_7$ ; (6)  $(\text{NaPO}_3)_x$ ; (7)  $(\text{NaPO}_2)_x$ ; (8)  $(\text{NaPO}_3)_x\cdot\text{NaO}$ ; (9)  $\text{Na}_4\text{P}_2\text{O}_9$   
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 52363

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** U.S. Bu. Mines toxic dust mask; protective gloves; chemical-type goggles; full-cover clothing  
3.2 **Symptoms Following Exposure:** Inhalation of heavy dust may irritate nose and throat. Ingestion may injure mouth, throat, and gastrointestinal tract, resulting in nausea, vomiting, cramps and diarrhea; pain and burning in mouth may occur. Contact with eyes produces local irritation; can lead to chronic damage. Contact with skin produces local irritation; repeated or prolonged contact can lead to dermatitis.  
3.3 **Treatment of Exposure:** If the following measures do not eliminate the symptoms, see a physician.  
INHALATION: give large amounts of water or warm salty water to induce vomiting; repeat until vomitus is clear; milk, eggs, or olive oil may then be given to soothe stomach. EYES: immediately flush with large amounts of water for at least 15 min., holding eyelids apart to ensure flushing of entire surface; avoid chemical neutralizers. SKIN: flush with water; avoid chemical neutralizers.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** May melt with loss of steam  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** All dissolve readily. MSP and ASPP form weakly acidic solutions; TSP forms strong caustic solution, similar to soda lye; TSPSP forms weakly alkaline solution.  
5.2 **Reactivity with Common Materials:** When wet, mild steel or brass may be corroded by MSP, ASPP, and TSP. The others are not considered corrosive.  
5.3 **Stability During Transport:** All forms of sodium phosphate are stable. TSP tends to pick up moisture from air and form a hard cake.  
5.4 **Neutralizing Agents for Acids and Caustics:** For those sodium phosphates that form acidic or basic solutions, dilution with water removes hazard.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 126 ppm/72 hr/daphnia magna/TL<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** All are available in Technical Grade, some in Food Grade and Reagent Grade. Some are available as hydrates as well as anhydrous forms.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not Pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** Values for anhydrous salts run from 120 to high polymer values.  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.8–2.5 at 25°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** +83 to –81 Btu/lb = +46 to –45 cal/g = +1.93 to –1.88 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 84.4 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM PHOSPHATE

SPP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	50.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# STEARIC ACID

SRA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Heptadecanecarboxylic acid Octadecanoic acid n-Octadecylic acid Stearophanic acid		Solid	White	Mild odor
		Floats on water.		
Keep people away. Avoid contact with solid and dust. Call fire department. Notify local health and pollution control agencies.				
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_{16}\text{CO}_2\text{H}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 57-11-4  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51376

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** For prolonged exposure to vapors, use air-supplied mask or chemical cartridge respirator; impervious gloves; goggles; impervious apron  
3.2 **Symptoms Following Exposure:** Compound is generally considered nontoxic. Inhalation of dust irritates nose and throat. Dust causes mild irritation of eyes.  
3.3 **Treatment of Exposure:** INGESTION: drink large volume of water; induce vomiting; call a physician. EYES: flush with clean water; if irritation, get medical attention. SKIN: wash thoroughly with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 0;  $\text{LD}_{50} > 15 \text{ g/kg}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** 20 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** (molten solid) 410–435°F O.C.; 365°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 743°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 123.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 36.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):**  $\text{N}_2$  diluent: 10.6%;  $\text{CO}_2$  diluent: 13.0%

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 144%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** USP; Commercial; Triple pressed; Double pressed  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not Pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** (avg.) 282  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** 157°F = 70°C = 343°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.86 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** -17,310 Btu/lb = -9,616 cal/g = -402.3 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# STEARIC ACID

SRA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# SUCROSE

SRS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Beet sugar Cane sugar Saccharose Saccharum Sugar	Solid  White  Odorless  Sinks in water.
Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with water.
<b>Exposure</b>	DUST Not harmful.  SOLID Not harmful.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_{12}H_{22}O_{11}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 57-50-1
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51692

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask and goggles or face shield
- 3.2 Symptoms Following Exposure: None
- 3.3 Treatment of Exposure: EYES: flush with water.
- 3.4 TLV-TWA: 10 mg/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 0; oral LD<sub>50</sub> (100 days) = 28,500 mg/kg/day (rat)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: None
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: 15 mg/m<sup>3</sup> total dust; 5 mg/m<sup>3</sup> respirable fraction.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent (combustible solid)
- 4.2 Flammable Limits in Air: Not pertinent
- 4.3 Fire Extinguishing Agents: Water
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Irritating fumes may form in fires.
- 4.6 Behavior in Fire: Melts and chars
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 57.1 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 33.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Indirect effect from high BOD
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): 69%, 5 days
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 0/BOD
  - Human Oral hazard: 0
  - Human Contact hazard: 0
  - Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Food grade; Technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 342.3
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: (decomposes) 320–367°F = 160–186°C = 433–459°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.59 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: 6,400 Btu/lb = –3,600 cal/g = –150 X 10<sup>3</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# SUCROSE

SRS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	180.400		N		N		N
36	181.799		O		O		O
38	183.199		T		T		T
40	184.599						
42	185.900		P		P		P
44	187.299		E		E		E
46	188.699		R		R		R
48	190.099		T		T		T
50	191.500		I		I		I
52	192.900		N		N		N
54	194.299		E		E		E
56	195.699		N		N		N
58	197.099		E		E		E
60	198.400		N		N		N
62	199.799		T		T		T
64	201.199						
66	202.599						
68	204.000						
70	205.400						
72	206.799						
74	208.199						
76	209.599						
78	210.900						
80	212.299						
82	213.699						
84	215.099						

# SODIUM SILICATE

SSC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Soluble glass Water glass	Thick liquid Colorless Odorless  Sinks and mixes with water.
Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Na}_2\text{SiO}_3\text{-Na}_2\text{SiO}_4\text{-H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 6834-92-0
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52383

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield.
- 3.2 Symptoms Following Exposure: If large doses are ingested, some irritation of mucous membranes may occur, similar to that caused by caustic soda solution.
- 3.3 Treatment of Exposure: INGESTION (large doses): give water or milk; do NOT induce vomiting.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5$  to  $5$  g/kg (human)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: None
- 3.10 Vapor (Gas) Irritant Characteristics: Non-volatile.
- 3.11 Liquid or Solid Characteristics: None
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not flammable
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not flammable
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 2320 ppm/96 hr/mosquito fish/TL<sub>50</sub>/fresh water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 2
  - Human Oral hazard: 1
  - Human Contact hazard: II
  - Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: A wide variety of grades, which differ in concentration of sodium silicate in water, in specific gravity, and in viscosity.
- 7.2 Storage Temperature: Inerted
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: C
- 7.6 Ship Type: 3
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: Not applicable
- 9.3 Boiling Point at 1 atm: Decomposes
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.1–1.7 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: (est.)  $-20$  Btu/lb =  $-10$  cal/g =  $-0.4 \times 10^5$  J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: 84.4 cal/g
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# SODIUM SILICATE

SSC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	68.660	52	0.700		N		N
44	68.660	54	0.700		O		O
46	68.660	56	0.700		T		T
48	68.660	58	0.700				
50	68.660	60	0.700		P		P
52	68.660	62	0.700		E		E
54	68.660	64	0.700		R		R
56	68.660	66	0.700		T		T
58	68.660	68	0.700		I		I
60	68.660	70	0.700		N		N
62	68.660	72	0.700		E		E
64	68.660	74	0.700		N		N
66	68.660	76	0.700		T		T
68	68.660	78	0.700				
70	68.660	80	0.700				
72	68.660	82	0.700				
74	68.660	84	0.700				
76	68.660	86	0.700				
78	68.660						
80	68.660						
82	68.660						
84	68.660						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SODIUM SELENITE

SSE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Disodium selenite Selenious acid, disodium salt	Solid  White to pink  Mixes with water.
Keep people away. Avoid contact with solid and dust. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST OR SOLID. POISONOUS IF INHALED OR SWALLOWED. Irritating to skin and eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> Not listed. <b>2.2 Formula:</b> Na <sub>2</sub> SeO <sub>3</sub> <b>2.3 IMO/UN Designation:</b> Not listed <b>2.4 DOT ID No.:</b> 2630 <b>2.5 CAS Registry No.:</b> 10102-18-8 <b>2.6 NAERG Guide No.:</b> 151 <b>2.7 Standard Industrial Trade Classification:</b> 52499
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Wear a respirator or dust mask, safety glasses or chemical goggles, and protective clothing (including gloves) to avoid skin contamination. <b>3.2 Symptoms Following Exposure:</b> INHALATION OR INGESTION: Nervousness and fear followed by vomiting, then quietness and somnolence. Respiration becomes difficult, dyspnea develops, followed by opisthotonos, tetanic spasm, colonic spasm, falling blood pressure, and respiratory failure. EYES: Can cause severe damage. SKIN: Severe irritation may occur. <b>3.3 Treatment of Exposure:</b> Call a physician. INHALATION: Follow "general procedures" for poisons. EYES: Wash with water. SKIN: Wash with copious amounts of water. INGESTION: Induce vomiting until vomit is clear, follow with gastric lavage and saline cathartics. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 4; LD <sub>50</sub> below 50 mg/kg. <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> A suspected carcinogen. Chronic exposure can cause gastrointestinal disorders, nervousness, pallor, coated tongue, and a garlicky odor of the breath. Liver and spleen damage, emaciation, apathy, and progressive anemia. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Currently not available <b>3.11 Liquid or Solid Characteristics:</b> Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:**  
Not flammable
- 4.2 Flammable Limits in Air:** Not flammable
- 4.3 Fire Extinguishing Agents:** Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 Special Hazards of Combustion Products:** Emits toxic NaO and Se dusts when heated to decomposition.
- 4.6 Behavior in Fire:** Decomposes at elevated temperatures (>320°C).
- 4.7 Auto Ignition Temperature:** Not pertinent
- 4.8 Electrical Hazards:** Currently not available
- 4.9 Burning Rate:** Not flammable
- 4.10 Adiabatic Flame Temperature:** Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 Flame Temperature:** Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction
- 5.2 Reactivity with Common Materials:** Currently not available
- 5.3 Stability During Transport:** Stable
- 5.4 Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 Polymerization:** Not pertinent
- 5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
10 ppm/98-144 hours/Goldfish/toxic/hard water  
10 to 100 ppm/96-hour/Fathead minnow/LC<sub>50</sub>  
0.9 to 1 ppm/96-hour/Daphne magna/LC<sub>50</sub>
- 6.2 Waterfowl Toxicity:** Currently not available
- 6.3 Biological Oxygen Demand (BOD):** Currently not available
- 6.4 Food Chain Concentration Potential:** Positive. Concentration factors for Se-marine and freshwater plants 800, invertebrates and fish 400.
- 6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 4  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Se-44% to 46.5% Total metallic impurities-0.02% to 0.1%
- 7.2 Storage Temperature:** Cool
- 7.3 Inert Atmosphere:** Currently not available
- 7.4 Venting:** Currently not available
- 7.5 IMO Pollution Category:** Currently not available
- 7.6 Ship Type:** Currently not available
- 7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Poison
- 8.2 49 CFR Class:** 6.1
- 8.3 49 CFR Package Group:** II
- 8.4 Marine Pollutant:** No
- 8.5 NFPA Hazard Classification:** Not listed
- 8.6 EPA Reportable Quantity:** 100 pounds
- 8.7 EPA Pollution Category:** B
- 8.8 RCRA Waste Number:** Not listed
- 8.9 EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Solid
- 9.2 Molecular Weight:** 172.95 (anhydrous salt) 263.01 (pentahydrate)
- 9.3 Boiling Point at 1 atm:** Decomposes
- 9.4 Freezing Point:** Decomposes
- 9.5 Critical Temperature:** Currently not available
- 9.6 Critical Pressure:** Currently not available
- 9.7 Specific Gravity:** Currently not available
- 9.8 Liquid Surface Tension:** Not pertinent
- 9.9 Liquid Water Interfacial Tension:** Not pertinent
- 9.10 Vapor (Gas) Specific Gravity:** (calculated) Anhydrous salt - 5.96 Pentahydrate - 9.07
- 9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 Latent Heat of Vaporization:** Currently not available
- 9.13 Heat of Combustion:** Not pertinent
- 9.14 Heat of Decomposition:** Currently not available
- 9.15 Heat of Solution:** Currently not available
- 9.16 Heat of Polymerization:** Not pertinent
- 9.17 Heat of Fusion:** Currently not available
- 9.18 Limiting Value:** Currently not available
- 9.19 Reid Vapor Pressure:** Currently not available

## NOTES

# SODIUM SELENITE

SSE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
62	53.700		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# SODIUM SULFITE

SSF

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Solid	Colorless	Odorless
	Sinks and mixes slowly with water.		
Notify local health and pollution control agencies. Avoid contact with solid.			
Fire	Not flammable.		
Exposure	CALL FOR MEDICAL AID.  SOLIDS If swallowed, may cause loss of consciousness. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Na<sub>2</sub>SO<sub>3</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 52344

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield.  
3.2 Symptoms Following Exposure: When ingested, solutions cause gastric irritation by the liberation of sulfurous acid. Because of rapid oxidation to sulfate, sulfites are well tolerated until large doses are reached; then violent colic and diarrhea, circulatory disturbances, central nervous depression, and death can occur.  
3.3 Treatment of Exposure: INGESTION: treatment is symptomatic and supportive; call a doctor.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Non-volatile  
3.11 Liquid or Solid Characteristics: Not pertinent  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Not flammable  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not flammable  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 2600 ppm/24, 48 & 96 hr/mosquito fish/TL<sub>m</sub>/fresh water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 0.12 lb/lb, instantaneous  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical anhydrous: 89-91%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: C  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 126.04  
9.3 Boiling Point at 1 atm: Decomposes  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 2.633 at 15°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# SODIUM SULFITE

SSF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	14.090		N		N		N
36	14.890		O		O		O
38	15.690		T		T		T
40	16.490						
42	17.290		P		P		P
44	18.090		E		E		E
46	18.890		R		R		R
48	19.690		T		T		T
50	20.490		I		I		I
52	21.290		N		N		N
54	22.090		E		E		E
56	22.890		N		N		N
58	23.690		E		E		E
60	24.490		N		N		N
62	25.290		T		T		T
64	26.090						
66	26.890						
68	27.690						
70	28.490						
72	29.290						
74	30.090						
76	30.890						
78	31.690						
80	32.490						
82	33.290						
84	34.090						



# SILICON TETRACHLORIDE

STC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Silicon chloride	Liquid  Colorless to light yellow  Suffocating odor  Reacts violently with water. Irritating gas is produced on contact with water.
Evacuate. KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. DO NOT USE WATER OR FOAM ON ADJACENT FIRES.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material  
Pump or dredge contaminated sediment

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{SiCl}_4$   
2.3 IMO/UN Designation: 8/1818  
2.4 DOT ID No.: 1818  
2.5 CAS Registry No.: 10026-04-7  
2.6 NAERG Guide No.: 156  
2.7 Standard Industrial Trade Classification: 52241

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Acid-canister-type gas mask or self-contained breathing apparatus; goggles or face shield; rubber gloves; other protective clothing to prevent contact with skin.
- 3.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of upper respiratory tract resulting in coughing, choking, and a feeling of suffocation; continued inhalation may produce ulceration of the nose, throat, and larynx; if inhaled deeply, edema of the lungs may occur. Contact of liquid with eyes causes severe irritation and painful burns; may cause permanent visual impairment. Liquid may cause severe burns of skin. Repeated skin contact with dilute solutions or exposure to concentrated vapors may cause dermatitis. Ingestion causes severe internal injury with pain in the throat and stomach, intense thirst, difficulty in swallowing, nausea, vomiting, and diarrhea; in severe cases, collapse and unconsciousness may result.
- 3.3 **Treatment of Exposure:** Get medical attention at once following any exposure to this compound.  
INHALATION: remove victim from contaminated atmosphere; if breathing has ceased, start mouth-to-mouth resuscitation; oxygen should only be administered by an experienced person when authorized by a physician; keep patient warm and comfortable. EYES: immediately flush with large quantities of running water for a minimum of 15 min.; continue irrigation for an additional 15 min. if physician is not available. SKIN: immediately flush affected area with water; severe or extensive burns may be caused by silicon tetrachloride, producing shock symptoms (rapid pulse, sweating and collapse); keep patient comfortably warm. INGESTION: if patient is conscious give large amounts of lime water or milk of magnesia; plain water should be given if neither of these is available; do NOT give sodium bicarbonate or make any attempt to induce vomiting; if patient is unconscious, do not give anything but ensure there is no obstruction to breathing (tongue should be kept forward and false teeth removed); he will be less likely to aspirate vomitus if placed in a face-downward position.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 4;  $\text{LD}_{50}$  <50 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam on adjacent fires  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Contact with water in foam applied to adjacent fires will produce irritating fumes of hydrogen chloride.  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts vigorously with water to evolve hydrogen chloride (hydrochloric acid)  
5.2 Reactivity with Common Materials: In presence of moisture will corrode metals; the reaction is not violent.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Flood with water, rinse with sodium bicarbonate or lime solution.  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical: 99.7+%; C.P.: 99.9+%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Dry air  
7.4 Venting: Pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 169.9  
9.3 Boiling Point at 1 atm: 135.7°F = 57.6°C = 330.8°K  
9.4 Freezing Point: -94°F = -70°C = 203°K  
9.5 Critical Temperature: 452.5°F = 233.6°C = 506.8°K  
9.6 Critical Pressure: 542 psia = 36.8 atm = 3.74 MN/m<sup>2</sup>  
9.7 Specific Gravity: 1.48 at 20°C (liquid)  
9.8 Liquid Surface Tension: 19.6 dynes/cm = 0.0196 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 5.86  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: 74.2 Btu/lb = 41.2 cal/g = 1.73 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: -742 Btu/lb = -412 cal/g = -17.3 X 10<sup>5</sup> J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# SILICON TETRACHLORIDE

STC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	94.669	35	0.190	52	0.957	10	0.625
40	94.330	40	0.190	54	0.957	15	0.611
45	93.980	45	0.190	56	0.957	20	0.597
50	93.629	50	0.190	58	0.957	25	0.584
55	93.290	55	0.190	60	0.957	30	0.572
60	92.940	60	0.190	62	0.957	35	0.559
65	92.589	65	0.190	64	0.957	40	0.548
70	92.250	70	0.190	66	0.957	45	0.537
75	91.900	75	0.190	68	0.957	50	0.526
80	91.549	80	0.190	70	0.957	55	0.516
85	91.209	85	0.190	72	0.957	60	0.506
90	90.860	90	0.190	74	0.957	65	0.496
95	90.509	95	0.190	76	0.957	70	0.487
100	90.169	100	0.190	78	0.957	75	0.478
				80	0.957	80	0.470
				82	0.957	85	0.462
				84	0.957	90	0.454
				86	0.957	95	0.446
				88	0.957	100	0.439

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	15	0.931	15	0.03104		N
	E	20	1.073	20	0.03539		O
	A	25	1.232	25	0.04024		T
	C	30	1.412	30	0.04562		
	T	35	1.612	35	0.05159		P
	S	40	1.837	40	0.05819		E
		45	2.088	45	0.06547		R
		50	2.366	50	0.07349		T
		55	2.676	55	0.08229		I
		60	3.019	60	0.09194		N
		65	3.398	65	0.10250		E
		70	3.815	70	0.11400		N
		75	4.275	75	0.12660		T
		80	4.781	80	0.14020		
		85	5.335	85	0.15500		
		90	5.941	90	0.17110		
		95	6.604	95	0.18840		
		100	7.327	100	0.20720		
		105	8.113	105	0.22740		
		110	8.969	110	0.24920		
		115	9.897	115	0.27260		
		120	10.900	120	0.29770		
		125	11.990	125	0.32460		
		130	13.170	130	0.35340		
		135	14.430	135	0.38410		
		140	15.800	140	0.41700		

# STANNOUS FLOURIDE

STF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Flouristan Tin difluoride	Crystalline solid      White  Sinks and mixes with water.
Keep people away. Wear goggles and self-contained respirator. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Will burn eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $\text{SnF}_2$ 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 52310
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Goggles and dust mask. 3.2 <b>Symptoms Following Exposure:</b> EYES: Severe irritation - corrosive, irreversible. SKIN: Corrosive on abraded skin, no effect on intact skin. 3.3 <b>Treatment of Exposure:</b> EYES: Flush with plenty of water for at least 15 minutes. SKIN: Flush with soap and water. INGESTION: Induce vomiting. Get medical attention. 3.4 <b>TLV-TWA:</b> 2 mg/m <sup>3</sup> as Sn. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; LD <sub>50</sub> = 50 to 500 mg/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Long exposure to large amounts of the fluoride may cause loss of weight, anorexia, anemia, wasting, and cachexia, and dental defects. An increase in bone density and discoloration of teeth may occur. A possible mutagen. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> No appreciable hazard. Practically harmless to intact skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 100 mg/m <sup>3</sup> 3.14 <b>OSHA PEL-TWA:</b> 2 mg/m <sup>3</sup> 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Avoid contact with acids - HF fumes may be produced.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Fluoride salts are toxic to fish at concentrations as low as 2.3 ppm.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Flourine is concentrated by aquatic animals.
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 97.5%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 156.70
- 9.3 **Boiling Point at 1 atm:** 1052°F = 850°C = 1123.2°K
- 9.4 **Freezing Point:** 419°F = 215°C = 488.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 2.79
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# STANNOUS FLOURIDE

STF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
64	42.000		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# STRONTIUM NITRATE

STN

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid powder      White      Odorless

Sinks and mixes with water.

Keep people away.  
Shut off ignition sources and call fire department.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
May cause fire and explode on contact with combustibles.  
POISONOUS GASES MAY BE PRODUCED IN FIRE.  
Wear goggles and self-contained breathing apparatus.  
Use extinguishing agents appropriate for the surrounding fire.

### Exposure

CALL FOR MEDICAL AID.  
  
SOLID  
Flush exposed areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{Sr}(\text{NO}_3)_2$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: 1507  
2.5 CAS Registry No.: 10042-76-9  
2.6 NAERG Guide No.: 140  
2.7 Standard Industrial Trade Classification: 52359

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Rubber gloves, goggles, laboratory coat.  
3.2 Symptoms Following Exposure: Dust is irritating to skin, eyes, and respiratory system.  
3.3 Treatment of Exposure: Call for medical aid. EYES: Rinse with water. SKIN: Wash with water for 15 minutes. INGESTION: Drink water, milk, or activated charcoal; then induce vomiting.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 2.75 \text{ g/kg (rat)}$   
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Ingestion of nitrates has been implicated with cancer increase.  
3.10 Vapor (Gas) Irritant Characteristics: Not pertinent.  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable.  
4.2 Flammable Limits in Air: Not pertinent.  
4.3 Fire Extinguishing Agents: Use extinguishing agents appropriate for the surrounding fire.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent.  
4.5 Special Hazards of Combustion Products: Yields toxic gaseous oxides of nitrogen when involved in fire.  
4.6 Behavior in Fire: While not flammable, as a strong oxidizer will increase the intensity of combustion. May explode on shock or exposure to intense heat.  
4.7 Auto Ignition Temperature: Not pertinent.  
4.8 Electrical Hazards: Not pertinent.  
4.9 Burning Rate: Not pertinent.  
4.10 Adiabatic Flame Temperature: Not pertinent.  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Not pertinent.  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Incompatible with oxidizable substances, organic materials, or combustible materials.  
5.3 Stability During Transport: Stable.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.  
5.5 Polymerization: Will not occur.  
5.6 Inhibitor of Polymerization: Not pertinent.

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99%; technical grades.  
7.2 Storage Temperature: Cool.  
7.3 Inert Atmosphere: None required.  
7.4 Venting: Not listed.  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer  
8.2 49 CFR Class: 5.1  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 211.63  
9.3 Boiling Point at 1 atm: 1193°F = 645°C = 918°K  
9.4 Freezing Point: 1058°F = 570°C = 843°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 2.98  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Currently not available  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent.  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# STRONTIUM NITRATE

STN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT PERTINENT		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
32 192	40.000 100.000		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

# SELENIUM TRIOXIDE

STO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Selenic anhydride	Solid White
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear goggles, dust respirator, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause coughing, nausea, and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse dissolved material  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not add water to undissolved material

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: SeO<sub>3</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 52239

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** This compound is highly toxic if ingested or inhaled. Dust mask; goggles or face shield; rubber gloves
- 3.2 **Symptoms Following Exposure:** Absorption of selenium may be demonstrated by presence of the element in the urine and by a garlic-like odor of breath. Inhalation can cause bronchial spasms, symptoms of asphyxiation, and pneumonitis. Acute symptoms of ingestion include sternal pain, cough, nausea, pallor, coated tongue, gastrointestinal disorders, nervousness and conjunctivitis. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give oxygen if necessary. INGESTION: induce vomiting; follow with gastric lavage and saline cathartics. EYES: flush immediately and thoroughly with water. SKIN: flush with water.
- 3.4 **TLV-TWA:** 0.2 mg/m<sup>3</sup> (as selenium)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 1 mg Se/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 0.2 mg/m<sup>3</sup> as selenium
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously with water to form selenic acid solution
- 5.2 **Reactivity with Common Materials:**  
Corrodes all metals when moisture is present
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; also shipped as a 40% solution in water (selenic acid)
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 126.9
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 244°F = 118°C = 391°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 3.6 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SELENIUM TRIOXIDE

STO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# STRYCHNINE

STR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Kwik-kill Mouse-tox Nux-vomica		Solid crystalline      Colorless to white      Odorless
		Sinks and mixes slowly in water.
Keep people away. Avoid contact with solid or dust. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Fire data not available. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID POISONOUS IF SWALLOWED Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim ingest a slurry of activated charcoal. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $C_{17}H_{15}N_3O_2$ 2.3 IMO/UN Designation: 6.1/1692 2.4 DOT ID No.: 1692 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 51579
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus, butyl rubber gloves, plastic working clothes. 3.2 <b>Symptoms Following Exposure:</b> INGESTION: First symptoms - uneasiness with a heightened reflex of irritability, followed by muscular twitching in some parts of the body. With larger doses, this is followed by a sense of impending suffocation. Convulsive movements begin which have the effect of mechanically causing the subject to cry out or shriek; then follows the characteristic spasms which set in with violence. These are first clonic then tonic. There are successive attacks with symptoms becoming more violent each time, eventually resulting in death. 3.3 <b>Treatment of Exposure:</b> Call a doctor. SKIN: Wash with concentrated soap solution. INGESTION: Gastric lavage with 2% tannic acid solution followed by 2 tablespoons of medicinal charcoal suspended in water and IV injection of 0.5 gm sodium amylal, which is repeated upon reappearance of convulsions. 3.4 TLV-TWA: 0.15 mg/m <sup>3</sup> . 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 4; LD <sub>50</sub> below 50 mg/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Allergen. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Odorless 3.13 <b>IDLH Value:</b> 3 mg/m <sup>3</sup> 3.14 <b>OSHA PEL-TWA:</b> 0.15 mg/m <sup>3</sup> 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Currently not available  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Emits toxic vapors when heated to decomposition.  
4.6 **Behavior in Fire:** When heated, emits highly toxic fumes.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Sensitive to light  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
96-hour TL<sub>50</sub> Bluegill = 0.87 mg/l  
96-hour TL<sub>50</sub> Atlantic silversides = 0.95 mg/l  
6.2 **Waterfowl Toxicity:** Waterfowl (mallard) = 2.9 ppm  
Duck LD<sub>50</sub> (oral) = 3 mg/kg  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 4  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** P108  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 334.40  
9.3 **Boiling Point at 1 atm:** 518°F = 270°C = 543.2°K  
9.4 **Freezing Point:** 514.4 to 558°F = 268 to 290°C = 541.2 to 563.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.36 at 20°C  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 11.5 (calculated)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# STRYCHNINE

STR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	518	0.097	518	0.00308		C U R R E N T L Y  N O T  A V A I L A B L E

# SODIUM THIOCYANATE SOLUTION (56% OR LESS)

STS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Rhodanate Sodium rhodanide Sodium sulfo cyanate	Liquid Clear to pale yellow Odorless
<b>Keep people away. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Use extinguishing agents appropriate for the surrounding fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 0; Unassigned cargoes  
2.2 **Formula:** NaSCN  
2.3 **IMO/UN Designation:** Not listed.  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** 540-72-7  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 52382

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber or plastic gloves; splash-proof goggles; rubber or plastic apron.  
3.2 **Symptoms Following Exposure:** Intensity of effects will vary with concentration of the solution. Inhalation of vapor causes irritation of nose and throat. Ingestion of large doses causes vomiting, extreme cerebral excitement, convulsions, and death in 10-48 hrs.; chronic poisoning can cause flu-like symptoms, skin rashes, weakness, fatigue, vertigo, nausea, vomiting, diarrhea, confusion. Contact with eyes causes irritation. Prolonged contact with skin may produce various skin eruptions, dizziness, cramps, nausea, and mild to severe disturbance of the nervous system.  
3.3 **Treatment of Exposure:** Call for medical aid. INHALATION: Move to fresh air. INGESTION: Consult physician; hemodialysis is recommended as the treatment of choice. EYES or SKIN: Flush with water for 15 min.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 764 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Causes birth defects in chick embryos.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable.  
4.2 **Flammable Limits in Air:** Not pertinent.  
4.3 **Fire Extinguishing Agents:** Use extinguishing agents appropriate for the surrounding fire.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.  
4.5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur and nitrogen may form in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent.  
4.8 **Electrical Hazards:** Not pertinent.  
4.9 **Burning Rate:** Not pertinent.  
4.10 **Adiabatic Flame Temperature:** Not pertinent.  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Not pertinent.  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
3,240 ppm/2 hr/fish/killed/fresh water  
>500 ppm/48 hr/green crab/TL=aerated salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (3)  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 50-60% solutions in water.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Open.  
7.5 **IMO Pollution Category:** (B)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 81.08  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SODIUM THIOCYANATE SOLUTION (56% OR LESS)

STS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# STYRENE

STY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Phenylethylene Styrol Styrolene Vinyl benzene	Watery liquid  Colorless to light yellow  Sweet pleasant odor  Floats on water. Flammable, irritating vapor is produced.
<b>Keep people away. Avoid contact with liquid and vapor. Wear chemical protective suit with self-contained breathing apparatus. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE CONTAINERS MAY EXPLODE IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear chemical protective suit with self-contained breathing apparatus. Combat fires from safe distance or protected location. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $C_6H_5CH=CH_2$   
2.3 IMO/UN Designation: 3.3/2055  
2.4 DOT ID No.: 2055  
2.5 CAS Registry No.: 100-42-5  
2.6 NAERG Guide No.: 128P  
2.7 Standard Industrial Trade Classification: 51125

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask or approved canister; rubber or plastic gloves; boots; goggles or face shield.
- 3.2 **Symptoms Following Exposure:** Moderate irritation of eyes and skin. High vapor concentrations cause dizziness, drunkenness, and anesthesia.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; keep warm and quiet; use artificial respiration if needed. INGESTION: do NOT induce vomiting; call physician; no known antidote. SKIN OR EYE CONTACT: flush with plenty of water; for eyes get medical attention.
- 3.4 TLV-TWA: 20 ppm  
3.5 TLV-STEL: 40 ppm  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5$  to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** 0.148 ppm  
3.13 **IDLH Value:** 700 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** 600 ppm, 5 minute peak in any 3 hours  
3.16 **OSHA PEL-Ceiling:** 200 ppm  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 93°F O.C. 88°F C.C.  
4.2 **Flammable Limits in Air:** 1.1%-6.1%  
4.3 **Fire Extinguishing Agents:** Water fog, foam, carbon dioxide, or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. At elevated temperatures such as in fire conditions, polymerization may take place which may lead to container explosion.  
4.7 **Auto Ignition Temperature:** 914°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 5.2 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 47.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):**  $N_2$  diluent: 9.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** May occur if heated above 150°F. Can cause rupture of container. Metal salts, peroxides, and strong acids may also cause polymerization.  
5.6 **Inhibitor of Polymerization:** Tertiary-butylcatechol, 10-15 ppm
- 6.1 **Aquatic Toxicity:** 22 ppm/96 hr/bluegill/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 18% (theor.), 412 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 6. WATER POLLUTION

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.5+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 2              |
- 8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 104.15  
9.3 **Boiling Point at 1 atm:** 293.4°F = 145.2°C = 418.4°K  
9.4 **Freezing Point:** -23.1°F = -30.6°C = 242.6°K  
9.5 **Critical Temperature:** 703.4°F = 373°C = 646.2°K  
9.6 **Critical Pressure:** 580 psia = 39.46 atm = 4.00 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.906 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 32.14 dynes/cm = 0.03214 N/m at 19°C  
9.9 **Liquid Water Interfacial Tension:** 35.48 dynes/cm = 0.03548 N/m at 19°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.074  
9.12 **Latent Heat of Vaporization:** 156 Btu/lb = 86.8 cal/g = 3.63 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** -277 Btu/lb = -154 cal/g = -6.45 X 10<sup>5</sup> J/kg  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.27 psia

### NOTES

# STYRENE

STY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	57.430	0	0.389	15	1.087	40	0.950
50	57.120	5	0.391	20	1.090	50	0.872
60	56.800	10	0.393	25	1.074	60	0.803
70	56.490	15	0.395	30	1.067	70	0.742
80	56.180	20	0.397	35	1.060	80	0.688
90	55.870	25	0.399	40	1.054	90	0.639
100	55.560	30	0.401	45	1.047	100	0.595
110	55.240	35	0.403	50	1.040	110	0.556
120	54.930	40	0.405	55	1.033	120	0.521
130	54.620	45	0.407	60	1.027	130	0.488
140	54.310	50	0.409	65	1.020	140	0.459
150	54.000	55	0.411	70	1.013	150	0.433
160	53.680	60	0.413	75	1.006	160	0.408
170	53.370	65	0.415	80	1.000	170	0.386
180	53.060	70	0.417	85	0.993	180	0.366
190	52.750	75	0.419	90	0.986	190	0.347
200	52.430	80	0.421	95	0.980	200	0.330
210	52.120	85	0.423	100	0.973	210	0.314
		90	0.424	105	0.966		
		95	0.426	110	0.959		
		100	0.428	115	0.953		
		105	0.430	120	0.946		
		110	0.432				
		115	0.434				
		120	0.436				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.300	40	0.034	40	0.00066	0	0.239
		50	0.049	50	0.00094	25	0.253
		60	0.070	60	0.00131	50	0.266
		70	0.099	70	0.00181	75	0.279
		80	0.137	80	0.00247	100	0.292
		90	0.188	90	0.00332	125	0.304
		100	0.254	100	0.00440	150	0.317
		110	0.339	110	0.00577	175	0.329
		120	0.447	120	0.00748	200	0.340
		130	0.583	130	0.00959	225	0.352
		140	0.753	140	0.01218	250	0.363
		150	0.963	150	0.01532	275	0.374
		160	1.221	160	0.01911	300	0.385
		170	1.534	170	0.02364	325	0.396
		180	1.912	180	0.02900	350	0.406
		190	2.365	190	0.03533	375	0.416
		200	2.905	200	0.04272	400	0.426
		210	3.542	210	0.05132	425	0.435
		220	4.292	220	0.06126	450	0.445
		230	5.167	230	0.07269	475	0.454
		240	6.183	240	0.08575	500	0.462
		250	7.358	250	0.10060	525	0.471
		260	8.709	260	0.11740	550	0.479
		270	10.250	270	0.13630	575	0.487
		280	12.010	280	0.15760	600	0.495
		290	14.010	290	0.18130		

# SILVER ACETATE

SVA

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid White to gray Odorless

Sinks in water.

Keep people away. Avoid contact with solid and dust.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

SOLID  
Irritating to skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_3\text{COOAg}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51371

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves  
3.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Contact with eyes or skin causes irritation. If continued for a long period, ingestion or inhalation of silver compounds can cause permanent discoloration of skin (argyria).  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: give large amount of water; induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water.  
3.4 TLV-TWA: 0.01 mg Ag/m<sup>3</sup>  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: 10 mg Ag/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 0.01 mg Ag/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Not pertinent  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; Purified  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 166.9  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 3.26 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# SILVER ACETATE

SVA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.735		N		N		N
36	0.751		O		O		O
38	0.767		T		T		T
40	0.782						
42	0.798		P		P		P
44	0.813		E		E		E
46	0.829		R		R		R
48	0.844		T		T		T
50	0.860		I		I		I
52	0.875		N		N		N
54	0.891		E		E		E
56	0.907		N		N		N
58	0.922		T		T		T
60	0.938						
62	0.953						
64	0.969						
66	0.984						
68	1.000						
70	1.016						
72	1.031						
74	1.047						
76	1.062						
78	1.078						
80	1.093						
82	1.109						
84	1.124						



# SILVER CARBONATE

SVC

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid Yellow to brown Odorless

Sinks in water.

Keep people away. Avoid contact with solid and dust.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

SOLID  
Irritating to skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Ag}_2\text{CO}_3$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52379

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; rubber gloves
- 3.2 Symptoms Following Exposure: Contact with eyes causes irritation. If continued for a long period, ingestion or inhalation of silver compounds can cause permanent discoloration of the skin (argyria).
- 3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water; induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water.
- 3.4 TLV-TWA: 0.01 mg  $\text{Ag}/\text{m}^3$
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 10 mg  $\text{Ag}/\text{m}^3$
- 3.14 OSHA PEL-TWA: 0.01 mg  $\text{Ag}/\text{m}^3$
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Decomposes to silver oxide, silver, and carbon dioxide; the reaction is not hazardous.
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent, 98+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 275.75
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 6.1 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# SILVER CARBONATE

SVC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.033		N		N		N
36	0.033		O		O		O
38	0.033		T		T		T
40	0.033						
42	0.033		P		P		P
44	0.033		E		E		E
46	0.033		R		R		R
48	0.033		T		T		T
50	0.033		I		I		I
52	0.033		N		N		N
54	0.033		E		E		E
56	0.033		N		N		N
58	0.033		E		E		E
60	0.033		N		N		N
62	0.033		T		T		T
64	0.033						
66	0.033						
68	0.033						
70	0.033						
72	0.033						
74	0.033						
76	0.033						
78	0.033						
80	0.033						
82	0.033						
84	0.033						

# SILVER FLUORIDE

SVF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Argentous fluoride Silver monofluoride	Solid  Yellow to gray  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: AgF  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 7783-95-1  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves.  
3.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion may cause vomiting, salty taste, abdominal pain, diarrhea, convulsions, collapse, thirst, disturbed color vision, and acute toxic nephritis. Contact with eyes causes irritation. Skin may be blackened on prolonged exposure.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: get medical attention at once, give large amount of water and induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water.  
3.4 **TLV-TWA:** 0.01 mg Ag/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 10 mg Ag/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 0.01 mg Ag/m<sup>3</sup>  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Commercial; Pure, 99.9+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 126.9  
9.3 **Boiling Point at 1 atm:** 2,118°F = 1,159°C = 1,432°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 5.82 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# SILVER FLUORIDE

SVF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	105.200		N		N		N
36	109.400		O		O		O
38	113.700		T		T		T
40	117.900						
42	122.099		P		P		P
44	126.299		E		E		E
46	130.500		R		R		R
48	134.799		T		T		T
50	139.000		I		I		I
52	143.199		N		N		N
54	147.400		E		E		E
56	151.699		N		N		N
58	155.900		T		T		T
60	160.099						
62	164.299						
64	168.500						
66	172.799						
68	177.000						
70	181.199						
72	185.400						
74	189.699						
76	193.900						
78	198.099						
80	202.299						
82	206.500						
84	210.799						

# SILVER IODATE

SVI

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid White Odorless

Sinks in water.

Keep people away. Avoid contact with solid and dust.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

SOLID  
Irritating to skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: AgIO<sub>3</sub>
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52339

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; protective gloves
- 3.2 Symptoms Following Exposure: Contact with eyes causes irritation. If continued for a long period, ingestion or inhalation of silver compounds can cause permanent discoloration of the skin (argyria).
- 3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water.
- 3.4 TLV-TWA: 0.01 mg Ag/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 10 mg Ag/m<sup>3</sup>
- 3.14 OSHA PEL-TWA: 0.01 mg Ag/m<sup>3</sup>
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 99+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 282.1
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 5.53 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# SILVER IODATE

SVI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.001		N		N		N
36	0.002		O		O		O
38	0.002		T		T		T
40	0.002						
42	0.002		P		P		P
44	0.002		E		E		E
46	0.002		R		R		R
48	0.003		T		T		T
50	0.003		I		I		I
52	0.003		N		N		N
54	0.003		E		E		E
56	0.003		N		N		N
58	0.003		E		E		E
60	0.003		N		N		N
62	0.004		T		T		T
64	0.004						
66	0.004						
68	0.004						
70	0.004						
72	0.004						
74	0.005						
76	0.005						
78	0.005						
80	0.005						
82	0.005						
84	0.005						

# SILVER NITRATE

SVN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lunar caustic	Solid crystals  Sinks and mixes with water.	Colorless to grayish black	Odorless
Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLIDS Irritating to skin and eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: AgNO<sub>3</sub>  
2.3 IMO/UN Designation: 5.1/1493  
2.4 DOT ID No.: 1493  
2.5 CAS Registry No.: 7761-88-8  
2.6 NAERG Guide No.: 140  
2.7 Standard Industrial Trade Classification: 52359

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves.  
3.2 Symptoms Following Exposure: Concentrated solutions will produce irritation, ulceration, and discoloration of the skin; also causes severe irritation of the eyes. Ingestion will produce violent abdominal pain and other gastroenteric symptoms.  
3.3 Treatment of Exposure: INGESTION: gastric lavage with dilute solution of sodium chloride, followed by cathartics and demulcents. Other treatment is symptomatic. SKIN: wash promptly.  
3.4 TLV-TWA: 0.01 mg Ag/m<sup>3</sup>  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Non-volatile  
3.11 Liquid or Solid Characteristics: Burns skin on prolonged contact.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: 10 mg Ag/m<sup>3</sup>  
3.14 OSHA PEL-TWA: 0.01 mg Ag/m<sup>3</sup>  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Increases flammability of combustibles.  
4.7 Auto Ignition Temperature: Not flammable  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not flammable  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
0.44 mg/1/48 hr/salmon fry/decidedly toxic/fresh water  
0.01-0.1 ppm"/paracentrotus/inhibit egg develop./salt water  
\*Time period not specified.  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent 99.8+%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer  
8.2 49 CFR Class: 5.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0 1            |
| Flammability (Red).....   | 0 0            |
| Instability (Yellow)..... | 0 0            |
| Special (White).....      | OX OX          |

- \* First column refers to non-fire situation.  
8.6 EPA Reportable Quantity: 1 pound  
8.7 EPA Pollution Category: X  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 169.87  
9.3 Boiling Point at 1 atm: Decomposes  
9.4 Freezing Point: 414°F = 212°C = 485°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 4.35 at 19°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 16.2 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# SILVER NITRATE

SVN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	126.299		N		N		N
36	131.599		O		O		O
38	136.900		T		T		T
40	142.299						
42	147.599		P		P		P
44	152.900		E		E		E
46	158.299		R		R		R
48	163.599		T		T		T
50	168.900		I		I		I
52	174.299		N		N		N
54	179.599		E		E		E
56	184.900		N		N		N
58	190.299		E		E		E
60	195.599		N		N		N
62	200.900		T		T		T
64	206.299						
66	211.599						
68	216.900						
70	222.299						
72	227.599						
74	232.900						
76	238.299						
78	243.599						
80	248.900						
82	254.299						
84	259.599						



# SILVER OXIDE

SVO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Argentous oxide	Solid  Brown-black  Odorless  Sinks in water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: Ag<sub>2</sub>O
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 20667-12-3
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52269

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; protective gloves
- 3.2 Symptoms Following Exposure: Contact with eyes causes mild irritation. If continued for a long period, ingestion or inhalation of silver compounds can cause permanent discoloration of the skin (argyria).
- 3.3 Treatment of Exposure: EYES: flush with water. SKIN: flush with water; wash with soap and water.
- 3.4 TLV-TWA: 0.01 mg Ag/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5-5 g/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: 10 mg Ag/m<sup>3</sup>
- 3.14 OSHA PEL-TWA: 0.01 mg Ag/m<sup>3</sup>
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Decomposes into metallic silver and oxygen. If large quantities are involved, the oxygen might increase the intensity of the fire.
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 99+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 231.8
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 7.14 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# SILVER OXIDE

SVO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# SILVER SULFATE

SVS

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid White to gray Odorless

Sinks and mixes with water.

Keep people away. Avoid contact with solid and dust.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

SOLID  
Irritating to skin and eyes.  
Harmful if swallowed.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{Ag}_2\text{SO}_4$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 52349

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; protective gloves.  
3.2 Symptoms Following Exposure: Contact with eyes causes irritation. If continued for a long period, ingestion or inhalation of silver compounds can cause permanent discoloration of the skin (argyria).  
3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water; induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water.  
3.4 TLV-TWA: 0.01 mg  $\text{Ag}/\text{m}^3$   
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available.  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 10 mg  $\text{Ag}/\text{m}^3$   
3.14 OSHA PEL-TWA: 0.01 mg  $\text{Ag}/\text{m}^3$   
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 0.4 ppm/48 hr/barnacles/lethal 90%/salt water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent; Commercial  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 311.80  
9.3 Boiling Point at 1 atm: Not pertinent  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 5.45 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 13.7 cal/g  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

## NOTES

# SILVER SULFATE

SVS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.579		N		N		N
36	0.589		O		O		O
38	0.598		T		T		T
40	0.607						
42	0.617		P		P		P
44	0.626		E		E		E
46	0.635		R		R		R
48	0.645		T		T		T
50	0.654		I		I		I
52	0.663		N		N		N
54	0.673		E		E		E
56	0.682		N		N		N
58	0.691		T		T		T
60	0.701						
62	0.710						
64	0.719						
66	0.729						
68	0.738						
70	0.747						
72	0.757						
74	0.766						
76	0.775						
78	0.785						
80	0.794						
82	0.803						
84	0.813						

# SULFUR

SXX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Brimstone	Liquid (molten solid)      Yellow, orange, tan, brown, or gray      Faint rotten eggs odor
	Thickens and sinks in water.
Keep people away. Avoid contact with liquid and solid. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GAS IS PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water or sand.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 0; Unassigned cargoes  
2.2 Formula: S  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 1350  
2.5 CAS Registry No.: 7704-34-9  
2.6 NAERG Guide No.: 133  
2.7 Standard Industrial Trade Classification: 52226

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety goggles with side shields; approved respirator; heat-resistant gloves; leather heat-resistant clothing. If recovered sulfur, refer to hydrogen sulfide.\*  
3.2 **Symptoms Following Exposure:** Can cause eye irritation; may rarely irritate skin. If recovered sulfur, refer to hydrogen sulfide.\*  
3.3 **Treatment of Exposure:** EYES: wash eyes carefully for at least 15 min. SKIN: Treat molten sulfur burns with petroleum jelly or mineral oil. If recovered sulfur, treat as for hydrogen sulfide.\*  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Non-volatile  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** If recovered sulfur, see hydrogen sulfide.\*  
3.13 **IDLH Value:** Not listed. \*Significant amounts of hydrogen sulfide, a very poisonous gas, may collect in poorly ventilated containers of liquid sulfur that has been recovered from hydrogen sulfide.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 405°F C.C. for recovered sulfur, see hydrogen sulfide.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Produces toxic sulfur dioxide gas.  
4.6 **Behavior in Fire:** Burns with a pale blue flame that may be difficult to see in daylight.  
4.7 **Auto Ignition Temperature:** 450°F; for recovered sulfur, see hydrogen sulfide.  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 4.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 1.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No hazardous reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 10,000 ppm/96 hr/mosquito fish/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0/0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Frasch liquid sulfur: 99.8+%; solid sulfur is sold in many varieties and grades; these are not presently covered in this manual.  
7.2 **Storage Temperature:** 270°F  
7.3 **Inert Atmosphere:** Ventilated (natural)  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** III  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Class 9  
8.2 **49 CFR Class:** 9  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1 2
Flammability (Red).....	1 1
Instability (Yellow).....	0 0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 256.51  
9.3 **Boiling Point at 1 atm:** 832.3°F = 444.6°C = 717.8°K  
9.4 **Freezing Point:** 251°F = 121.7°C = 394.9°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.80 at 120°C (liquid)  
9.8 **Liquid Surface Tension:** 60.8 dynes/cm = 0.0608 N/m at 120°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 127°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.582 (est.)  
9.12 **Latent Heat of Vaporization:** 120 Btu/lb = 69 cal/g = 2.9 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -4,741 Btu/lb = -2,634 cal/g = -110.3 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 9.2 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Very low

### NOTES

# SULFUR

SXX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
255	112.400	260	0.230		N O T  P E R T I N E N T	251	11.130
260	112.299	280	0.232			252	11.010
265	112.099	300	0.234			253	10.890
270	112.000	320	0.236			254	10.770
275	111.900	340	0.237			255	10.660
280	111.700	360	0.239			256	10.550
285	111.599	380	0.241			257	10.440
290	111.400	400	0.243			258	10.330
295	111.299	420	0.244			259	10.220
300	111.200	440	0.246			260	10.110
305	111.000	460	0.248			261	10.000
310	110.900	480	0.250			262	9.901
315	110.799	500	0.252			263	9.798
320	110.599	520	0.253			264	9.697
		540	0.255			265	9.597
		560	0.257			266	9.498
		580	0.259			267	9.401
		600	0.260			268	9.305
		620	0.262			269	9.210
		640	0.264			270	9.116
		660	0.266			271	9.024
		680	0.268			272	8.932
		700	0.269			273	8.842
		720	0.271			274	8.753
						275	8.665
						276	8.579

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B I L E		260	0.001	260	0.00005	90	0.021
		280	0.003	280	0.00008	100	0.021
		300	0.004	300	0.00014	110	0.021
		320	0.007	320	0.00023	120	0.021
		340	0.012	340	0.00036	130	0.021
		360	0.019	360	0.00056	140	0.021
		380	0.030	380	0.00085	150	0.021
		400	0.046	400	0.00127	160	0.021
		420	0.068	420	0.00185	170	0.021
		440	0.100	440	0.00266	180	0.021
		460	0.144	460	0.00375	190	0.021
		480	0.205	480	0.00522	200	0.021
		500	0.287	500	0.00716	210	0.021
		520	0.397	520	0.00968	220	0.021
		540	0.541	540	0.01294	230	0.021
		560	0.729	560	0.01709	240	0.021
		580	0.971	580	0.02232	250	0.021
		600	1.279	600	0.02885	260	0.021
		620	1.668	620	0.03692		
		640	2.154	640	0.04681		
		660	2.757	660	0.05884		
		680	3.498	680	0.07334		
		700	4.401	700	0.09069		
		720	5.495	720	0.11130		
		740	6.810	740	0.13570		

# TRIMETHYLACETIC ACID

TAA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> alpha, alpha-Dimethyl-propionic acid Neopentanoic acid Pivalic acid Propanoic acid, 2,2-di-methyl-	Solid  Colored  Floats on and slowly mixes with water.
<b>Keep people away. Avoid contact with solid and dust. Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	COMBUSTIBLE. Produces vapors irritating to eyes and skin. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to eyes and skin. Harmful if swallowed. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enter water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Chemical and Physical Treatment: Neutralize	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 <b>CG Compatibility Group:</b> 4; Organic acids 2.2 <b>Formula:</b> (CH <sub>3</sub> ) <sub>3</sub> CCOOH 2.3 <b>IMO/UN Designation:</b> Not listed 2.4 <b>DOT ID No.:</b> Not listed 2.5 <b>CAS Registry No.:</b> 75-98-9 2.6 <b>NAERG Guide No.:</b> Not listed 2.7 <b>Standard Industrial Trade Classification:</b> 51377
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Wear self-contained positive breathing apparatus and full protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Because of low volatility, it is relatively harmless when inhaled at normal ambient temperature (around 20°C). It is slightly toxic by ingestion or skin absorption. The vapor is irritating at elevated temperatures. Can cause considerable discomfort by oral routes; may cause reversible or irreversible changes to exposed tissue, not permanent injury or death. 3.3 <b>Treatment of Exposure:</b> INHALATION: Remove victim to fresh air, get medical attention if irritation persists. EYES: Hold eyelids open and flush with plenty of water for at least 15 minutes and get medical attention. SKIN: Contaminated skin should be washed with soap and water. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 900 mg/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Tumorigenic in animal studies (mouse). 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> At elevated temperatures, vapor is irritating to eyes and skin. 3.11 <b>Liquid or Solid Characteristics:</b> Solid is irritating to eyes and skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 147.2°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Contain acid smoke and fumes.  
4.6 **Behavior in Fire:** Decomposes to produce acid smoke and fumes.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Cover contaminated surfaces with soda ash or sodium bicarbonate; add water to form slurry. Remove slurry and rinse area with soda ash solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
400-357 mg/l (pH 5)/ 24-96 hr/goldfish/LD<sub>50</sub> 4.5 g/l (pH 7)/ 24 hr/goldfish/LD<sub>50</sub>  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 102.13  
9.3 **Boiling Point at 1 atm:** 325-327°F = 163-164°C = 436-437°K  
9.4 **Freezing Point:** 91-95°F = 33-35°C = 306-308°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.905 at 50°C  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.5 (est.)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# TRIMETHYLACETIC ACID

TAA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
122	56.500		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	2.500		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# TRIETHYLALUMINUM

TAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aluminum triethyl ATE TEA	Liquid  Colorless  IGNITES WHEN EXPOSED TO AIR. Flammable gas is produced on contact with water.
Evacuate. Keep people away. Shut off ignition sources and call fire department. Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	IGNITES WHEN EXPOSED TO AIR. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry graphite, soda ash, or other inert powder. DO NOT USE WATER, FOAM, CARBON DIOXIDE, DRY CHEMICALS OR VAPORIZING LIQUIDS ON FIRE. DO NOT USE WATER ON ADJACENT FIRES.
<b>Exposure</b>	Call for medical aid.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (C<sub>2</sub>H<sub>5</sub>)<sub>3</sub>Al  
2.3 IMO/IUN Designation: 4.2/1102  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full protective clothing, preferably of aluminized glass cloth; goggles; face shield; gloves. In case of fire, all-purpose canister or self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** Exposure to smoke from fire causes metal-fume fever (flu-like symptoms). Since liquid ignites spontaneously, contact with eyes or skin causes severe burns.
- 3.3 **Treatment of Exposure:** INHALATION: only fumes from fire need be considered; metal-fume fever is not critical, lasting less than 36 hrs. EYES: flush gently with copious quantities of water for 15 min. with lids held open; treat burns if fire occurred; get medical attention. SKIN: wash with water; treat burns caused by fire; get medical attention.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent (ignites instantly in air, reacts vigorously with water)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second-and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Ignites spontaneously in air at all temperatures
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Inert powders (sand, limestone), dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam, halogenated extinguishing agents.
- 4.5 **Special Hazards of Combustion Products:** Intense smoke may cause metal-fume fever.
- 4.6 **Behavior in Fire:** Dense smoke of aluminum oxide forms. Contact with water applied to adjacent fires causes violent reaction producing toxic and flammable gases.
- 4.7 **Auto Ignition Temperature:** Not pertinent (self-ignites at ambient temperature)
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently to form flammable ethane gas
- 5.2 **Reactivity with Common Materials:** No significant reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Not pertinent
- 6.2 **Waterfowl Toxicity:** Not pertinent
- 6.3 **Biological Oxygen Demand (BOD):** Not pertinent
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 92+%. 20% or less by weight in benzene, hexane, or heptane. Solutions are not pyrophoric.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Inerted; dry nitrogen at 5 psig
- 7.4 **Venting:** Safety relief, with rupture disc
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 3              |
| Special (White).....      | W              |

\* Up to 20% by weight in hydrocarbon solution.

- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 114.2
- 9.3 **Boiling Point at 1 atm:** 367.9°F = 186.6°C = 459.8°K
- 9.4 **Freezing Point:** -51°F = -46°C = 227°K
- 9.5 **Critical Temperature:** 761.0°F = 405°C = 678.2°K
- 9.6 **Critical Pressure:** 1,970 psia = 134 atm = 13.6 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.836 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 26.1 dynes/cm = 0.0261 N/m at 28°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** 216 Btu/lb = 120 cal/g = 5.02 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -18,364 Btu/lb = -10,202 cal/g = -426.85 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -1,995 Btu/lb = -1,109 cal/g = -46.40 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRIETHYLALUMINUM

TAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
55	52.460	34	0.476	52	1.129	55	3.241
60	52.350	36	0.477	54	1.129	60	3.069
65	52.230	38	0.478	56	1.129	65	2.910
70	52.110	40	0.479	58	1.129	70	2.761
75	52.000	42	0.481	60	1.129	75	2.623
80	51.880	44	0.482	62	1.129	80	2.494
85	51.760	46	0.483	64	1.129	85	2.374
90	51.650	48	0.484	66	1.129	90	2.261
95	51.530	50	0.485	68	1.129	95	2.156
100	51.420	52	0.486	70	1.129	100	2.057
105	51.300	54	0.487	72	1.129	105	1.965
110	51.180	56	0.488	74	1.129	110	1.878
115	51.070	58	0.489	76	1.129	115	1.796
120	50.950	60	0.491	78	1.129	120	1.719
125	50.840	62	0.492	80	1.129	125	1.647
130	50.720	64	0.493	82	1.129	130	1.579
135	50.600	66	0.494	84	1.129	135	1.515
140	50.490	68	0.495	86	1.129	140	1.454
145	50.370	70	0.496			145	1.397
150	50.250	72	0.497			150	1.343
155	50.140	74	0.498			155	1.292
160	50.020	76	0.499			160	1.244
165	49.910	78	0.501			165	1.198
170	49.790	80	0.502			170	1.154
175	49.670	82	0.503			175	1.113
180	49.560	84	0.504			180	1.074

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	180	0.079	180	0.00132		N
	E	190	0.115	190	0.00189		O
	A	200	0.165	200	0.00267		T
	C	210	0.234	210	0.00371		
	T	220	0.326	220	0.00510		P
	S	230	0.449	230	0.00693		E
		240	0.612	240	0.00931		R
		250	0.826	250	0.01238		T
		260	1.103	260	0.01630		I
		270	1.458	270	0.02126		N
		280	1.910	280	0.02747		E
		290	2.480	290	0.03520		N
		300	3.195	300	0.04474		T
		310	4.082	310	0.05642		
		320	5.176	320	0.07063		
		330	6.516	330	0.08779		
		340	8.148	340	0.10840		
		350	10.120	350	0.13300		

# P-TOLUENESULFONIC ACID

TAP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methylbenzenesulfonic acid Tosic acid p-TSA	Solid	Colorless to black	Odorless or slight odor
Mixes with water.			
Keep people away. Avoid contact with solid and dust. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Irritating gases may be produced when heated. Flood discharge area with water.		
<b>Exposure</b>	Call for medical aid.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>SO<sub>3</sub>H  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** 2583  
2.5 **CAS Registry No.:** 104-15-4  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51140

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Chemical goggles or face shield; rubber gloves  
3.2 **Symptoms Following Exposure:** Contact with eyes or skin causes severe irritation. Ingestion causes irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** EYES: wash thoroughly with copious amounts of water for at least 15 min.; call physician if irritation persists. SKIN: wash thoroughly with large amounts of water for at least 15 min. INGESTION: give large amount of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 400 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
Not pertinent (solid with low flammability)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur may be formed.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 40.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** A strong acid which can react with common metals  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 93+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 172.2  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** 219–221°F = 104–105°C = 377–378°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.45 at 25°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** –50 Btu/lb = –28 cal/g = –1.2 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# P-TOLUENESULFONIC ACID

TAP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	270.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 2,4,5-TRICHLOROPHENOXYACETIC ACID, SODIUM SALT

TAS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,4,5-T sodium salt	Solid Light tan  Mixes with water.
Keep people away. Avoid contact. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID. Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE AT VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** C<sub>6</sub>H<sub>3</sub>Cl<sub>3</sub>OCH<sub>2</sub>COONa  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear rubber gloves and boots, safety goggles or face mask, hooded suit and a self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** INHALATION: Inflamed mucous membranes. EYES: Contact may cause irritation and swelling. SKIN: Irritation, rashes and swelling. INGESTION: Weakness and lethargy, anorexia, diarrhea, spasticity and possible death from ventricular fibrillation and subsequent cardiac arrest.
- 3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove to fresh air. If needed give artificial respiration. EYES: Flush with running water. SKIN: Wash with soap and water. INGESTION: Give activated charcoal followed by emesis or gastric lavage. Follow by saline cathartic.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** (est.) Grade 2; LD<sub>50</sub> = 300 to >1,000 mg/kg. Based on acute toxicities of chlorophenoxy herbicides and their esters and salts.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes birth defects in laboratory animals. This may be caused by the contaminant dioxin.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water fog, CO<sub>2</sub> or dry chemical.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Emits noxious fumes.
- 4.6 **Behavior in Fire:** Emits noxious fumes, including chlorides.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.56 ppm/48-hour/Bluegill/LC<sub>50</sub> (est. based on 2,4,5-T).  
1.3 ppm/48-hour/Rainbow trout/LC<sub>50</sub> (est. based on 2,4,5-t).
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Away from heat.
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Currently not available
- 9.2 **Molecular Weight:** 254.48.
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** Currently not available
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2,4,5-TRICHLOROPHENOXYACETIC ACID, SODIUM SALT

TAS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# TRIBUTYL PHOSPHATE

TBP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Phosphoric acid, tri-butyl ester TBP Tri-n-butyl phosphate	Liquid Colorless to pale yellow Odorless
<b>Keep people away. Avoid contact with liquid or vapors. Wear self-contained breathing apparatus and full protective clothing. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Emits toxic fumes in fire. Wear self-contained breathing apparatus and full protective clothing. Extinguish with dry chemical, foam, or water spray.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to the eyes, nose and throat. May be harmful if inhaled. Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. May be harmful if swallowed or absorbed through skin. IF IN EYES: hold eyelids open and flush with plenty of water. Remove contaminated clothing, flush affected areas with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters
- 2.2 Formula: (n-C<sub>4</sub>H<sub>9</sub>O)<sub>3</sub>PO
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 126-73-8
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, rubber gloves, safety goggles.
- 3.2 **Symptoms Following Exposure:** May cause stimulation of the central nervous system.
- 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 minutes, holding eyelids open if necessary. SKIN: Wash affected areas with soap and plenty of water.
- 3.4 **TLV-TWA:** 0.2 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 3 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 30 ppm
- 3.14 **OSHA PEL-TWA:** 5 mg/m<sup>3</sup>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 295°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** CO<sub>2</sub>, dry chemical, fog, mist
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic fumes of PO<sub>x</sub>
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** 770°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 85.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 26.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Dry lime or soda ash
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 3
  - Human Oral hazard: 1
  - Human Contact hazard: II
  - Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 266.32
- 9.3 **Boiling Point at 1 atm:** 552°F = 289°C = 562°K
- 9.4 **Freezing Point:** <-112°F = <-80°C = <193°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.982 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 9.20
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRIBUTYL PHOSPHATE

TBP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	60.720		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	77	3.390

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# TETRABUTYL TITANATE

TBT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butyl titanate Butyl titanate monomer Orthotitanic acid, tetrabutyl ester Titanium butoxide Titanium tetrabutoxide	Liquid  Colorless to light yellow  Weak alcohol-like odor  May float or sink in water. Reacts with water.
<b>Keep people away.</b> <b>Avoid contact with liquid and vapor.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Containers may explode in fire. Extinguish with dry chemicals or carbon dioxide. <b>DO NOT USE WATER ON FIRE.</b> Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $Ti(OC_4H_9)_4$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus or organic canister mask; goggles or face shield; rubber gloves
- 3.2 **Symptoms Following Exposure:** Inhalation causes nonspecific irritation of the upper respiratory tract. Contact with liquid may cause corneal damage in eyes and local irritation of skin. Ingestion causes nonspecific irritation of gastrointestinal tract, nausea, vomiting, cramps, and diarrhea; in severe cases, central nervous system depression may result.
- 3.3 **Treatment of Exposure:** INHALATION: move from contaminated atmosphere; if symptoms of respiratory discomfort persist, see a physician. EYES: immediately flush with large quantities of running water for a minimum of 15 min.; obtain medical attention if irritation persists. SKIN: immediately flush affected areas with water; obtain medical attention if irritation persists. INGESTION: give large amounts of water or warm salty water to induce vomiting; if this measure is unsuccessful, vomiting may be induced by tickling the back of the patient's throat with a finger; vomiting should be encouraged until vomitus is clear; obtain medical attention if abdominal discomfort persists.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 170°F C.C.
- 4.2 Flammable Limits in Air: 2%-12%
- 4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Water
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: May give off dense white smoke. Containers may explode.
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: 3.4 mm/min.
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 114.2 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 35.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts to form butanol and titanium dioxide; the reaction is not hazardous.
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open (flame arrester)
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 340
- 9.3 Boiling Point at 1 atm: 593°F = 312°C = 585°K
- 9.4 Freezing Point: -67°F = -55°C = 218°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 0.998 at 25°C (liquid)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: 142 Btu/lb = 79 cal/g =  $3.3 \times 10^5$  J/kg
- 9.13 Heat of Combustion: (est.) -14,600 Btu/lb = -8,100 cal/g =  $-340 \times 10^5$  J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# TETRABUTYL TITANATE

TBT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	62.420	51	0.350	51	0.645	52	150.500
36	62.420	52	0.350	52	0.645	54	140.799
38	62.420	53	0.350	53	0.645	56	131.699
40	62.420	54	0.350	54	0.645	58	123.299
42	62.420	55	0.350	55	0.645	60	115.500
44	62.420	56	0.350	56	0.645	62	108.200
46	62.420	57	0.350	57	0.645	64	101.500
48	62.420	58	0.350	58	0.645	66	95.160
50	62.420	59	0.350	59	0.645	68	89.299
52	62.420	60	0.350	60	0.645	70	83.839
54	62.420	61	0.350	61	0.645	72	78.759
56	62.420	62	0.350	62	0.645	74	74.020
58	62.420	63	0.350	63	0.645	76	69.589
60	62.420	64	0.350	64	0.645	78	65.459
62	62.420	65	0.350	65	0.645	80	61.600
64	62.420	66	0.350	66	0.645	82	58.000
66	62.420	67	0.350	67	0.645	84	54.630
68	62.420	68	0.350	68	0.645	86	51.480
70	62.420						
72	62.420						
74	62.420						
76	62.420						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 1,2,3-TRICHLOROBENZENE

TBZ

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzene, 1,2,3-trichloro- Pyranol 1478 V-Trichlorobenzene Vic-Trichlorobenzene	Solid	Colorless	Sharp chlorobenzene odor
Sinks in water. Freezing point is 45.1 - 51.8°F			
Keep people away. Avoid contact with liquid. Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible Poisonous gases are produced in fire. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray, fog or foam; large fires: water spray, fog or foam.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be irritating to eyes, skin and respiratory tract. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Liquid May irritate skin and eyes. Poisonous if swallowed. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. Wash skin with soap and water. If swallowed and victim is conscious, have victim drink water or milk and induce vomiting. If swallowed and victim is unconscious or having convulsions, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: C<sub>6</sub>H<sub>3</sub>Cl<sub>3</sub>
- 2.3 IMO/UN Designation: 6.1/2321
- 2.4 DOT ID No.: 2321
- 2.5 CAS Registry No.: 87-61-6
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification:  
51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation may cause irritation of respiratory tract. Irritating to the eyes. May redden skin on contact. Ingestion may cause liver damage.
- 3.3 **Treatment of Exposure:** INHALATION: Move to fresh air; call emergency medical care. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 minutes; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If swallowed and victim is conscious, have victim drink water or milk induce vomiting. If swallowed and victim is unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 756-766 mg/kg (rat,mouse)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Has caused liver damage in animals; carcinogenic.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation. Personnel will find high concentrations unpleasant. The affect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. May cause irritation if spilled on clothing and allowed to remain.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 230°F O.C. 210°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, carbon dioxide, water spray or foam; large fires: water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** May emit toxic hydrogen chloride and phosgene gases in fire.
- 4.6 **Behavior in Fire:** Decomposes to form hydrogen chloride and phosgene gases in fire.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
100 ppm/micro life/98% kill/fresh water  
>10 ppm/48 hr/hard clam eggs/ LC<sub>50</sub>/salt water  
>10 ppm/288 hr/hard clam larvae/ LC<sub>50</sub>/salt water  
3.13 ppm/ 48 hr/ oyster eggs/ LC<sub>50</sub>/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** < 1 lb/lb, 8 days
- 6.4 **Food Chain Concentration Potential:**  
Low potential
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 181.5
- 9.3 **Boiling Point at 1 atm:** 425.3°F = 218.5°C = 491.7°K
- 9.4 **Freezing Point:** 126.5°F = 52.5°C = 325.7°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.69 at 25°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 6.26 (est.)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** 113 btu/lb = 63 cal/g = 2.62 X 10<sup>3</sup> J/kg
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Not pertinent

### NOTES

# 1,2,3-TRICHLOROBENZENE

TBZ

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	105.000		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	125 150 175 200 225 250 275 300 325 350 375 400	0.034 0.081 0.169 0.319 0.560 0.926 1.459 2.211 3.240 4.616 6.417 8.734	125 150 175 200 225 250 275 300 325 350 375 400	0.00099 0.00224 0.00445 0.00805 0.01359 0.02170 0.03315 0.04879 0.06963 0.09678 0.13150 0.17516		C U R R E N T L Y  N O T  A V A I L A B L E

# 2,4,5-TRICHLOROPHENOXYACETIC ACID

TCA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,4,5-T	Solid	White	Odorless
Sinks in water.			
Keep people away. Avoid contact with solid and dust. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with water, dry chemicals, foam, or carbon dioxide.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 2, 4, 5-Cl<sub>3</sub>C<sub>6</sub>H<sub>2</sub>OCH<sub>2</sub>COOH  
2.3 IMO/UN Designation: 6.1/2765  
2.4 DOT ID No.: 2765  
2.5 CAS Registry No.: 93-76-5  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask and rubber gloves  
3.2 **Symptoms Following Exposure:** Overexposure to dust by inhalation or ingestion may cause fatigue, nausea, vomiting, lowered blood pressure, convulsions, coma. Dust may irritate eyes and skin.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if required, give artificial respiration. EYES: flush with water until irritating dust is removed. SKIN: wash with soap and water. INGESTION: call physician at once; induce vomiting and administer gastric lavage.  
3.4 **TLV-TWA:** 10 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 500 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Birth defects in rats and mice. Causes an acne-like skin eruption among human workers  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 250 mg/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 10 mg/m<sup>3</sup>  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (solid)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene gases may be formed.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 33.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 12.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Can be corrosive to common metals  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
11.0 ppm/24 hr/bluegill/TL<sub>50</sub>/fresh water  
0.32 ppm/48 hr/spot/50% kill/salt water  
6.2 **Waterfowl Toxicity:** 21,000 ppm LD<sub>50</sub>  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Will not bioconcentrate  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: 0  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** U232  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 255.5  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** 316°F = 158°C = 431°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.803 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -6,500 Btu/lb = -3,600 cal/g = -150 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2,4,5-TRICHLOROPHENOXYACETIC ACID

TCA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.024		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 1,2,4-TRICHLOROBENZENE

TCB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Benzene, 1,2,4-trichloro- unsym-Trichlorobenzene 1,2,4-Trichlorobenzol	Liquid or solid	Colorless	Sharp chlorobenzene odor
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear self-contained positive breathing apparatus and full protective clothing. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be irritating to eyes, skin and respiratory tract. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID May irritate skin and eyes. Poisonous if swallowed. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting. If swallowed and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 36; Halogenated hydrocarbon  
2.2 **Formula:** C<sub>6</sub>HCl<sub>3</sub>  
2.3 **IMO/UN Designation:** 6.1/2321  
2.4 **DOT ID No.:** 2321  
2.5 **CAS Registry No.:** 120-82-1  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.  
3.2 **Symptoms Following Exposure:** Exposures to high concentrations via inhalation are potentially hazardous to the lungs, kidneys and liver. Prolonged or repeated exposures or short exposure to high concentrations via inhalation are potentially hazardous to the lungs, kidneys and liver. Prolonged or repeated exposure to the eyes is likely to result in moderate pain and transient irritation. Prolonged or repeated contact with the skin may result in moderate irritation and possible systemic effects. Ingestion: May cause kidney and liver damage.  
3.3 **Treatment of Exposure:** INHALATION: If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Flush with running water for at least 15 minutes; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If victim is conscious, have victim drink water or milk and have induce vomiting by touching a finger to the back of his throat.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 5 ppm  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 300 mg/Kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May cause lung, liver, and/or kidney damage. Causes teratogenic effects in the rat.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation. Personnel may find high concentrations unpleasant. The affect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 **Odor Threshold:** 3 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 230°F O.C. 210°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** May contain toxic hydrogen chloride and phosgene.  
4.6 **Behavior in Fire:** Decomposes to form hydrogen chloride and phosgene.  
4.7 **Auto Ignition Temperature:** 1,060°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.5 ppm/1 hr/rainbow trout/LC<sub>50</sub>/fresh water  
0.45 ppm/96 hr/mysid shrimp/LC<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
78%(theor), 20 days; 100%(theor), 20 days; 50%(theor), 20 days  
6.4 **Food Chain Concentration Potential:**  
Low potential  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: Z  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Purified (99%); Technical: 75% 1,2,4-Trichlorobenzene and 25% 1,2,3-Trichlorobenzene  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Not pertinent  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 181.5  
9.3 **Boiling Point at 1 atm:** 415°F = 213°C = 486°K  
9.4 **Freezing Point:** 61.7°F = 16.5°C = 289.5°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.454 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 6.25  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 113 Btu/lb = 62.9 cal/g = 2.64 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1,2,4-TRICHLOROBENZENE

TCB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	100 125 150 175 200 225 250 275 300 325 350 375 400	0.014 0.040 0.095 0.200 0.375 0.658 1.087 1.712 2.593 3.797 5.406 7.511 10.216	100 125 150 175 200 225 250 275 300 325 350 375 400	0.00043 0.00117 0.00264 0.00523 0.00946 0.01597 0.02551 0.03896 0.05735 0.08185 0.11378 0.15459 0.20594		C U R R E N T L Y  N O T  A V A I L A B L E



# TRICHLOROETHANE

TCE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aerotherene Chlorothene Methylchloroform 1,1,1-Trichloroethane	Watery liquid	Colorless	Sweet odor
Sinks in water. Irritating vapor is produced.			
<b>Keep people away.</b> <b>Avoid contact with liquid and vapor.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, or foam.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, may produce nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 36; Halogenated hydrocarbon  
2.2 Formula: CH<sub>2</sub>CCl<sub>3</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2831  
2.5 CAS Registry No.: 71-55-6  
2.6 NAERG Guide No.: 160  
2.7 Standard Industrial Trade Classification: 51134

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor-acid gas canister; self-contained breathing apparatus for emergencies; neoprene or polyvinyl-alcohol-type gloves; chemical safety goggles and face shield; neoprene safety shoes (or leather safety shoes plus neoprene footwear); neoprene or polyvinyl alcohol suit or apron for splash protection.
- 3.2 **Symptoms Following Exposure:** INHALATION: symptoms range from loss of equilibrium and incoordination to loss of consciousness; high concentration can be fatal due to simple asphyxiation combined with loss of consciousness. INGESTION: produces effects similar to inhalation and may cause some feeling of nausea. EYES: slightly irritating and lachrymatory. SKIN: defatting action may cause dermatitis.
- 3.3 **Treatment of Exposure:** Get medical attention for all eye exposures and any other serious over-exposures. Do NOT administer adrenalin or epinephrine; otherwise, treatment is symptomatic. INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting. EYES: flush thoroughly with water. SKIN: remove contaminated clothing and wash exposed area thoroughly with soap and warm water.
- 3.4 TLV-TWA: 350 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: 450 ppm  
3.7 Toxicity by Ingestion: Grade 1; LD<sub>50</sub> = 5 to 15 g/kg (rat, mouse, rabbit, guinea pig)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 Odor Threshold: 100 ppm  
3.13 IDLH Value: 700 ppm  
3.14 OSHA PEL-TWA: 350 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** 7%-16%  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are generated in fires.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 932°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** (est.) 2.9 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 9.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 14.0%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly, releasing corrosive hydrochloric acid.  
5.2 **Reactivity with Common Materials:** Corrodes aluminum, but reaction is not hazardous.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 75-150 ppm\*/pinfish/TL<sub>50</sub>/salt water  
\*Time period not specified.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Uninhibited; inhibited; industrial inhibited; white room; cold cleaning  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: U226  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 133.41  
9.3 Boiling Point at 1 atm: 165°F = 74°C = 347°K  
9.4 Freezing Point: <-38°F = <-39°C = <234°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.31 at 20°C (liquid)  
9.8 Liquid Surface Tension: 25.4 dynes/cm = 0.0254 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 45 dynes/cm = 0.045 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: 4.6  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.104  
9.12 Latent Heat of Vaporization: 100 Btu/lb = 58 cal/g = 2.4 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: (est.) 4700 Btu/lb = 2600 cal/g = 110 X 10<sup>5</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: 4.0 psia

### NOTES

# TRICHLOROETHANE

TCE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	85.419	55	0.240		N	15	1.363
10	84.870	60	0.242		O	20	1.295
20	84.309	65	0.244		T	25	1.231
30	83.759	70	0.246			30	1.172
40	83.200	75	0.248		P	35	1.117
50	82.650	80	0.250		E	40	1.065
60	82.089	85	0.252		R	45	1.017
70	81.540	90	0.254		T	50	0.972
80	80.981	95	0.256		I	55	0.929
90	80.429	100	0.258		N	60	0.889
100	79.870	105	0.260		E	65	0.852
110	79.320	110	0.262		N	70	0.817
120	78.759	115	0.264		T	75	0.784
130	78.209	120	0.266			80	0.753
140	77.650	125	0.268			85	0.723
150	77.099	130	0.270				
160	76.540	135	0.272				
		140	0.274				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.070	70	2.099	70	0.04925	0	0.146
		75	2.364	75	0.05495	25	0.150
		80	2.657	80	0.06119	50	0.155
		85	2.980	85	0.06799	75	0.159
		90	3.335	90	0.07540	100	0.163
		95	3.725	95	0.08346	125	0.167
		100	4.152	100	0.09220	150	0.171
		105	4.619	105	0.10170	175	0.175
		110	5.130	110	0.11190	200	0.179
		115	5.686	115	0.12300	225	0.183
		120	6.292	120	0.13490	250	0.186
		125	6.950	125	0.14770	275	0.190
		130	7.663	130	0.16150	300	0.193
		135	8.437	135	0.17630	325	0.196
		140	9.273	140	0.19220	350	0.199
		145	10.180	145	0.20920	375	0.202
		150	11.150	150	0.22730	400	0.205
		155	12.200	155	0.24670	425	0.208
		160	13.330	160	0.26730	450	0.210
		165	14.540	165	0.28930	475	0.213
		170	15.840	170	0.31270	500	0.215
		175	17.240	175	0.33760	525	0.217
		180	18.730	180	0.36390	550	0.219
		185	20.330	185	0.39180	575	0.222
		190	22.030	190	0.42140	600	0.223

# TRICHLOROFLUOROMETHANE

TCF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Arcton 9 Eskimon 11 F-11 Freon 11 Frigen 11 Genetron 11 Isceon 11 Isotron 11 Ucon 11	Liquid  Colorless  Odorless  Sinks in water. Harmful vapor is produced. Boiling point is 75°F.
Keep people away. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Not harmful.
<b>Water Pollution</b>	Not harmful to aquatic life. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Pump Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: CFCs 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: 75-69-4 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51137
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Air line respirator; rubber gloves; monogoggles 3.2 <b>Symptoms Following Exposure:</b> Breathing concentrations approaching 10% in air will cause dizziness and drowsiness. Contact with tissues may cause frostbite. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove victim to non-contaminated area and apply artificial respiration if breathing has stopped; call a physician immediately; oxygen inhalation may be utilized. SKIN: if frostbite has occurred, flush areas with warm water. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> 1,000 ppm 3.7 <b>Toxicity by Ingestion:</b> Currently not available 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Non-irritating 3.11 <b>Liquid or Solid Characteristics:</b> May cause frostbite. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 2,000 ppm 3.14 <b>OSHA PEL-TWA:</b> 1,000 ppm 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Produces irritating and toxic products when heated to decomposition temperatures.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** U121
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Currently not available
- 9.2 **Molecular Weight:** Currently not available
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** Currently not available
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# TRICHLOROFLUOROMETHANE

TCF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-35	100.200	-140	0.189		N		N
-30	99.809	-120	0.191		O		O
-25	99.459	-100	0.193		T		T
-20	99.110	-80	0.196				
-15	98.770	-60	0.198		P		P
-10	98.419	-40	0.200		E		E
-5	98.070	-20	0.202		R		R
0	97.730	0	0.204		T		T
5	97.379	20	0.207		I		I
10	97.030	40	0.209		N		N
15	96.690	60	0.211		E		E
20	96.339	80	0.213		N		N
25	95.990	100	0.216		T		T
30	95.650	120	0.218				
35	95.299	140	0.220				
40	94.950	160	0.222				
45	94.610						
50	94.259						
55	93.910						
60	93.570						
65	93.219						
70	92.870						
75	92.520						
80	92.179						
85	91.830						
90	91.480						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.110	-50	0.560	-50	0.01749	30	0.127
		-40	0.780	-40	0.02381	35	0.127
		-30	1.072	-30	0.03193	40	0.127
		-20	1.451	-20	0.04223	45	0.127
		-10	1.937	-10	0.05514	50	0.127
		0	2.554	0	0.07113	55	0.127
		10	3.329	10	0.09072	60	0.127
		20	4.291	20	0.11450	65	0.127
		30	5.473	30	0.14310	70	0.127
		40	6.914	40	0.17710	75	0.127
		50	8.655	50	0.21740	80	0.127
		60	10.740	60	0.26450	85	0.127
		70	13.220	70	0.31950	90	0.127
		80	16.150	80	0.38300	95	0.127
		90	19.580	90	0.45600	100	0.127
		100	23.580	100	0.53930	105	0.127
		110	28.210	110	0.63390	110	0.127
		120	33.550	120	0.74080	115	0.127
						120	0.127
						125	0.127
						130	0.127
						135	0.127
						140	0.127
						145	0.127
						150	0.127
						155	0.127

# TRICHLOROACETALDEHYDE

TCH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Anhydrous chloral Acetaldehyde, trichloro Chloral Ethanal, trichloro-	Oily liquid  Colorless  Pungent, irritating  Sinks and mixes. Combines with water to yield chloral hydrate.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear positive pressure breathing apparatus and chemical protective suit. Call fire department. Stay upwind and use water spray to knock down vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE OR WHEN HEATED. Containers may explode in fire. Wear positive pressure breathing apparatus and chemical protective suit. Fight fire from safe distance or protected location. Extinguish small fire: dry chemical, carbon dioxide, water spray or foam; large fires: water spray, fog or foam. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS. MAY BE FATAL IF INHALED. Irritating to eyes, skin and respiratory tract. Inhalation causes sore throat, shortness of breath, drowsiness, irritation of respiratory tract, unconsciousness. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS. MAY BE FATAL IF SWALLOWED OR ABSORBED THROUGH SKIN. May burn skin and eyes. IF IN EYES OR ON SKIN, immediately flush contaminated area with running water for at least 15 minutes; hold upper and lower eyelids open occasionally if appropriate. Speed in removing material from skin is extremely important. Remove and isolate contaminated clothing at the site. Effects may be delayed. Keep victim under observation. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effects of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CCl3CHO  
2.3 IMO/UN Designation: 6.1/2075  
2.4 DOT ID No.: 2075  
2.5 CAS Registry No.: 75-87-6  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear positive pressure breathing apparatus and special chemical protective clothing.
- 3.2 **Symptoms Following Exposure:** INHALATION: Sore throat, shortness of breath, drowsiness, irritation of respiratory tract, unconsciousness. EYES: Redness, pain and blurred vision. SKIN: Redness and pain. INGESTION: Dizziness, drowsiness, nausea, and unconsciousness. Acute hazard: Poison may be fatal if inhaled, swallowed, or absorbed through skin.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: In case of contact with material, immediately flush eyes or skin with running water for at least 15 minutes. Hold upper and lower eyelids open occasionally. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. INGESTION: If victim is unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> = 23 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Chronic respiratory exposure in animals caused decreases in kidney function, liver function, growth rate and serum transaminase activity along with changes in the central nervous system and in blood factors.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant and is very injurious to the eyes. Contact may cause burns to skin and eyes.  
3.12 **Odor Threshold:** 0.047 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 167°F. (procedure not identified)  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Small fires: Dry chemical, carbon dioxide, water spray or foam. Large fires: Water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Contain toxic and irritating gases including phosgene.  
4.6 **Behavior in Fire:** Decomposes in the presence of heat of fire to produce toxic and irritating gases.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 7.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 4.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Forms water-soluble hydrate.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable (Avoid exposure to sunlight)  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** It is estimated that fish in rivers, ponds, lakes, and reservoirs will bioconcentrate chloral 6.7 times the water concentration.  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 2  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 40% Aqueous solution  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Not listed  
7.4 **Venting:** Not listed  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	-
Instability (Yellow).....	-

  
8.6 EPA Reportable Quantity: 5000 pounds  
8.7 EPA Pollution Category: D  
8.8 RCRA Waste Number: U034  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 147.38  
9.3 Boiling Point at 1 atm: 207.9°F. = 97.7°C. = 370.9°K.  
9.4 Freezing Point: -71.5°F. = -57.5°C. = 215.7°K.  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 1.510 at 20°C.  
9.8 Liquid Surface Tension: 25.34 dynes/cm = 0.0253 N/m at 19.4°C.  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 5.1  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: 103.4 Btu/lb = 57.5 cal/g = 2.4 X 10<sup>5</sup> J/kg  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# TRICHLOROACETALDEHYDE

TCH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	94.300		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	-25 0 25 50 75 100 125 150 175	0.071 0.130 0.241 0.444 0.820 1.514 2.794 5.157 9.519	-25 0 25 50 75 100 125 150 175	0.00150 0.00279 0.00517 0.00959 0.01778 0.03296 0.06111 0.11332 0.21011		C U R R E N T L Y  N O T  A V A I L A B L E

# TRICHLOROETHYLENE

TCL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlorylen Gemalene Trethylene Trichloran Triclene; algylen Trilene	Watery liquid      Colorless      Sweet odor  Sinks in water. Irritating vapor is produced.
<b>Keep people away.</b> <b>Avoid contact with liquid and vapor.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, difficult breathing, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 36; Halogenated hydrocarbon  
2.2 **Formula:**  $\text{CHCl}_2=\text{CCl}_2$   
2.3 **IMO/UN Designation:** 9.0/1710  
2.4 **DOT ID No.:** 1710  
2.5 **CAS Registry No.:** 79-01-6  
2.6 **NAERG Guide No.:** 160  
2.7 **Standard Industrial Trade Classification:** 51132

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor-acid gas canister; self-contained breathing apparatus for emergencies; neoprene or vinyl gloves; chemical safety goggles; face-shield; neoprene safety shoes; neoprene suit or apron for splash protection.
- 3.2 **Symptoms Following Exposure:** INHALATION: symptoms range from irritation of the nose and throat to nausea, an attitude of irresponsibility, blurred vision, and finally disturbance of central nervous system resulting in cardiac failure. Chronic exposure may cause organic injury. INGESTION: symptoms similar to inhalation. SKIN: defatting action can cause dermatitis. EYES: slightly irritating sensation and lachrymation.
- 3.3 **Treatment of Exposure:** Do NOT administer adrenalin or epinephrine; get medical attention for all cases of overexposure. INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting; repeat three times; then give 1 tablespoon epsom salts in water. EYES: flush thoroughly with water. SKIN: wash thoroughly with soap and warm water.
- 3.4 **TLV-TWA:** 50 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** 100 ppm  
3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 50 ppm  
3.13 **IDLH Value:** 1,000 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** 300 ppm, 5 minute peak in any 2 hours.  
3.16 **OSHA PEL-Ceiling:** 200 ppm  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 90°F C.C. practically nonflammable  
4.2 **Flammable Limits in Air:** 8.0%-10.5%  
4.3 **Fire Extinguishing Agents:** Water fog  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are produced in fire situations.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 770°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 9.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 4.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):**  $\text{N}_2$  diluent: 9.0% at 100°C

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 660 mg/l/40 hr/daphnia/kill/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation:  
Damage to living resources:  
Human Oral hazard:  
Human Contact hazard:  
Reduction of amenities:

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; dry cleaning; degreasing; extraction  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U228  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 131.39  
9.3 **Boiling Point at 1 atm:** 189°F = 87°C = 360°K  
9.4 **Freezing Point:** -123.5°F = -86.4°C = 186.8°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.46 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 29.3 dynes/cm = 0.0293 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 34.5 dynes/cm = 0.0345 N/m at 24°C  
9.10 **Vapor (Gas) Specific Gravity:** 4.5  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.116  
9.12 **Latent Heat of Vaporization:** 103 Btu/lb = 57.2 cal/g =  $2.4 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 2.5 psia

### NOTES

# TRICHLOROETHYLENE

TCL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	94.669	0	0.220		N	15	0.800
5	94.410	10	0.221		O	20	0.775
10	94.150	20	0.223		T	25	0.750
15	93.889	30	0.225			30	0.727
20	93.629	40	0.226		P	35	0.705
25	93.370	50	0.228		E	40	0.684
30	93.110	60	0.230		R	45	0.664
35	92.849	70	0.231		T	50	0.645
40	92.589	80	0.233		I	55	0.627
45	92.330	90	0.235		N	60	0.610
50	92.070	100	0.236		E	65	0.593
55	91.809	110	0.238		N	70	0.577
60	91.549	120	0.240		T	75	0.562
65	91.290	130	0.241			80	0.548
70	91.030	140	0.243			85	0.534
75	90.770	150	0.245			90	0.521
80	90.509	160	0.246			95	0.508
85	90.250	170	0.248			100	0.496
90	89.990					105	0.485
95	89.730					110	0.474
100	89.469					115	0.463
105	89.209					120	0.453
110	88.950						
115	88.690						
120	88.429						
125	88.169						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.110	40	0.508	40	0.01245	0	0.136
		50	0.678	50	0.01628	25	0.139
		60	0.894	60	0.02105	50	0.143
		70	1.166	70	0.02695	75	0.146
		80	1.507	80	0.03418	100	0.149
		90	1.929	90	0.04296	125	0.152
		100	2.448	100	0.05354	150	0.155
		110	3.081	110	0.06619	175	0.157
		120	3.846	120	0.08120	200	0.160
		130	4.765	130	0.09891	225	0.162
		140	5.862	140	0.11960	250	0.165
		150	7.163	150	0.14380	275	0.167
		160	8.695	160	0.17180	300	0.169
		170	10.490	170	0.20390	325	0.172
		180	12.580	180	0.24080	350	0.174
		190	15.010	190	0.28280	375	0.176
		200	17.810	200	0.33040	400	0.177
		210	21.020	210	0.38420	425	0.179
						450	0.181
						475	0.182
						500	0.184
						525	0.185
						550	0.186
						575	0.187
						600	0.188



# 1,1,2-TRICHLOROETHANE

TCM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethane, 1,1,2-trichloro- beta-trichloroethane Vinyl trichloride	Liquid  Colorless  Sweet, chloroform like odor  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources and call fire department. Evacuate area in case of large discharge. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	POISONOUS GASES ARE PRODUCED IN FIRE. Container may explode in fire. Wear self-contained positive pressure breathing apparatus, impervious clothing and gloves. Extinguish fires with water spray, fog or foam, carbon dioxide, or dry chemical.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, throat, lungs and skin; may cause defatting dermatitis. Highly toxic; death may result from respiratory failure. If inhaled, anesthetic or narcotic effect may occur. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes; severe irritant to gastrointestinal tract. Highly toxic. If swallowed, may cause liver or kidney damage and may increase myocardial irritability. May cause chemical pneumonia if aspirated into lungs. IF IN EYES OR ON SKIN, hold eyelids open and flush with water for at least 15 minutes; hold eyelids open if necessary. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water and induce vomiting. IF SWALLOWED AND VICTIM UNCONSCIOUS OR HAVING CONVULSIONS, just keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 36; Halogenated hydrocarbon <b>2.2 Formula:</b> CHCl <sub>2</sub> CH <sub>2</sub> Cl <b>2.3 IMO/UN Designation:</b> Currently not available <b>2.4 DOT ID No.:</b> Not listed <b>2.5 CAS Registry No.:</b> 79-00-5 <b>2.6 NAERG Guide No.:</b> Not listed. <b>2.7 Standard Industrial Trade Classification:</b> 51134
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Self-contained positive pressure breathing apparatus and full protective clothing. <b>3.2 Symptoms Following Exposure:</b> Inhalation causes irritation of the nose, throat, and lungs. High concentrations may cause death by respiratory failure. Highly toxic by ingestion; may cause liver or kidney damage or myocardial irritability. Causes severe irritation of the gastrointestinal tract. Vapor may produce superficial skin burns or defatting type dermatitis and may irritate the eyes. <b>3.3 Treatment of Exposure:</b> INHALATION: Move to fresh air; call emergency medical care. If breathing stops, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: If victim is conscious get victim to induce vomiting by touching the back of the throat with his finger or by taking syrup of ipecac. If victim is unconscious or having convulsions, do nothing except keep victim warm. EYES OR SKIN: Flush with running water for at least 15 minutes; hold eyelids open if necessary. Clean skin with soap or mild detergent. Remove and isolate contaminated clothing and shoes at the site. <b>3.4 TLV-TWA:</b> 10 ppm (skin) <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Inhalation:</b> Grade 2; LD <sub>50</sub> = 580 mg/kg (rat) <b>3.8 Toxicity by Ingestion:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Causes liver and kidney damage; may increase myocardial irritability. It is a central nervous system depressant. It is carcinogenic. May cause chemical pneumonia if aspirated into the lungs. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause moderate irritation such that personnel will not tolerate moderate or high concentrations. <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on skin and allowed to remain, may cause smarting and reddening of the skin. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> 100 ppm (skin) <b>3.14 OSHA PEL-TWA:</b> 10 ppm (skin) <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:**  
None.
- 4.2 Flammable Limits in Air:** 8.4% - 13.3%
- 4.3 Fire Extinguishing Agents:** Small fires:  
dry chemical or CO<sub>2</sub>. Large fires: water  
spray, fog or foam.
- 4.4 Fire Extinguishing Agents Not to Be  
Used:** Not pertinent
- 4.5 Special Hazards of Combustion  
Products:** Toxic gases including  
hydrogen chloride and very small  
amounts of phosgene and chlorine are  
produced.
- 4.6 Behavior in Fire:** Forms a flammable  
vapor-air mixture at 109°F and higher.
- 4.7 Auto Ignition Temperature:** Not pertinent
- 4.8 Electrical Hazards:** Currently not  
available
- 4.9 Burning Rate:** Currently not available
- 4.10 Adiabatic Flame Temperature:** Currently  
not available
- 4.11 Stoichiometric Air to Fuel Ratio:** 9.5  
(calc.)
- 4.12 Flame Temperature:** Currently not  
available
- 4.13 Combustion Molar Ratio (Reactant to  
Product):** 5.0 (calc.)
- 4.14 Minimum Oxygen Concentration for  
Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction
- 5.2 Reactivity with Common Materials:**  
Incompatible with oxidizing material or  
aluminum. Will attack some forms of  
plastics, rubber and coatings.
- 5.3 Stability During Transport:** Stable
- 5.4 Neutralizing Agents for Acids and  
Caustics:** Not pertinent
- 5.5 Polymerization:** Not pertinent
- 5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:**  
18 mg/l/48 hr/daphnia magna/LC<sub>50</sub>/fresh  
water.
- 6.2 Waterfowl Toxicity:** Currently not  
available
- 6.3 Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 Food Chain Concentration Potential:**  
Currently not available
- 6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Technical grade; stabilized;  
95%
- 7.2 Storage Temperature:** Currently not available
- 7.3 Inert Atmosphere:** Currently not available
- 7.4 Venting:** Currently not available
- 7.5 IMO Pollution Category:** C
- 7.6 Ship Type:** 3
- 7.7 Barge Hull Type:** 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed
- 8.2 49 CFR Class:** Not pertinent
- 8.3 49 CFR Package Group:** Not listed.
- 8.4 Marine Pollutant:** No
- 8.5 NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity:** 100 pounds
- 8.7 EPA Pollution Category:** B
- 8.8 RCRA Waste Number:** U227
- 8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid
- 9.2 Molecular Weight:** 133.41
- 9.3 Boiling Point at 1 atm:** 236.6°F = 113.7°C =  
386.9°K
- 9.4 Freezing Point:** -31/-34.1°F = -35/-36.7°C  
= 238.2/236.5°K
- 9.5 Critical Temperature:** Currently not available
- 9.6 Critical Pressure:** Currently not available
- 9.7 Specific Gravity:** 1.44 at 20°C (liquid)
- 9.8 Liquid Surface Tension:** 33.75 dynes/cm =  
0.0338 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension:** Currently  
not available
- 9.10 Vapor (Gas) Specific Gravity:** 4.6
- 9.11 Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 Latent Heat of Vaporization:** Currently not  
available
- 9.13 Heat of Combustion:** Currently not available
- 9.14 Heat of Decomposition:** Not pertinent
- 9.15 Heat of Solution:** Not pertinent
- 9.16 Heat of Polymerization:** Not pertinent
- 9.17 Heat of Fusion:** Currently not available
- 9.18 Limiting Value:** Currently not available
- 9.19 Reid Vapor Pressure:** Currently not  
available

## NOTES

# 1,1,2-TRICHLOROETHANE

TCM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	89.900		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	0 25 50 75 100 125 150 175 200	0.049 0.093 0.179 0.344 0.660 1.265 2.427 4.656 8.933	0 25 50 75 100 125 150 175 200	0.00130 0.00239 0.00439 0.00805 0.01478 0.02712 0.04976 0.09130 0.16753		C U R R E N T L Y  N O T  A V A I L A B L E

# 1,2,3-TRICHLOROPROPANE

TCN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Allyl trichloride Glycerol trichlorohydrin Propane, 1,2,3-trichloro Trichlorohydrin	Liquid  Liquid sinks in water.	Colorless	Strong acid odor
<b>Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, rubber gloves, and overclothing made of rubber, polyethylene or polyvinyl chloride. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>			
<b>Fire</b>	Combustible. Highly toxic and irritating fumes are generated when ignited. Wear goggles, self-contained breathing apparatus, rubber gloves, and overclothing made of rubber, polyethylene or polyvinyl chloride. Extinguish fire with water, foam, carbon dioxide or dry chemical.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, throat, and skin. If inhaled, will cause anesthesia, dizziness, and nausea. Move to fresh air. IF BREATHING has stopped, give artificial respiration. IF BREATHING is difficult, give oxygen.  LIQUID Harmful if swallowed. Irritating to skin and eyes. Flush affected areas with plenty of water. Remove from skin with soap and water. Remove contaminated clothing. IF IN EYES, hold eyelids open and flush with water for 15 minutes. If swallowed and victim is CONSCIOUS, give two glasses of water and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 36; Halogenated hydrocarbon  
2.2 Formula:  $\text{CH}_2\text{ClCHClCH}_2\text{Cl}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51134

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, safety goggles, impermeable clothing, and other equipment to prevent contact with the body. Organic canister or air pack as required.
- 3.2 **Symptoms Following Exposure:** Inhalation of vapor causes anesthesia, dizziness, and nausea. Vapor is highly irritating by inhalation routes and moderately irritating by dermal routes. Exposure of eyes to vapor may result in slight, transient injury to the cornea.
- 3.3 **Treatment of Exposure:** Get medical assistance. INHALATION: Remove victim to fresh air. If breathing has stopped give artificial respiration. INGESTION: If conscious, give two glasses of water and induce vomiting. No specific antidote. EYES: Hold eyelids open, flush with water for 15 minutes. SKIN: Flush immediately with water. Remove liquid from skin with soap and water. Remove contaminated clothing.
- 3.4 TLV-TWA: 10 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3;  $\text{LD}_{50}$  = 320-505 mg/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Toxicity is cumulative. Causes damage to heart, liver, and kidneys in humans. May cause death or permanent injury after very short exposure to small quantities.  
3.10 Vapor (Gas) Irritant Characteristics: Severe irritant to eyes and skin. High irritant via oral and inhalation routes.  
3.11 Liquid or Solid Characteristics: Rated 4 on scale of 1-10 when tested externally on eyes of rabbits. Dermal  $\text{LD}_{50}$  (rabbit) = 1.77 g/kg.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 100 ppm.  
3.14 OSHA PEL-TWA: 50 ppm.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 174°F O.C. 164°F C.C.  
4.2 Flammable Limits in Air: 3.2% - 12.6%  
4.3 Fire Extinguishing Agents: Water; foam; carbon dioxide; dry chemical  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent.  
4.5 Special Hazards of Combustion  
Products: Highly toxic chloride fumes including hydrochloric acid.  
4.6 Behavior in Fire: It burns and produces highly toxic chloride fumes.  
4.7 Auto Ignition Temperature: 579°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 16.7 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 7.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Not reactive.  
5.2 Reactivity with Common Materials: Can react vigorously with oxidizing materials. Avoid bases. Decomposition reaction may be initiated by aluminum, magnesium and their alloys.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Will not occur  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 90% min. to 99+%  
7.2 Storage Temperature: Store out of direct sunlight.  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: C  
7.6 Ship Type: 2  
7.7 Barge Hull Type: 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  
Category Classification  
Health Hazard (Blue)..... 3  
Flammability (Red)..... 2  
Instability (Yellow)..... 0  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 147.43  
9.3 Boiling Point at 1 atm: 314.33°F = 156.85°C = 429.85°K  
9.4 Freezing Point: 58.5°F = 14.7°C = 331.5°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 1.3889 at 20°C (liquid)  
9.8 Liquid Surface Tension: 37.8 dynes/cm = 0.0378 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 5.0  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Not pertinent.  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# 1,2,3-TRICHLOROPROPANE

TCN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# TRICRESYL PHOSPHATE (>= 1% ORTHO ISOMER)

TCO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> o-Cresylphosphate Phosphoric acid, tris(2-methylphenyl) ester o-Tolylphosphate phosphoric acid Tri-o-cresyl ester	Liquid  Colorless  Odorless  Sinks in water.
<b>Keep people away. Avoid contact with liquid or vapor. Wear positive pressure breathing apparatus and special chemical protective clothing. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible POISONOUS GASES ARE PRODUCED IN FIRE. Wear positive pressure breathing apparatus and special chemical protective clothing. Extinguish with dry chemical, carbon dioxide, water spray, fog or foam. (Water or foam may cause frothing.) Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID  VAPOR OR LIQUID Poisonous. May be fatal if inhaled, swallowed or absorbed through skin. Exposure causes nausea, vomiting, diarrhea and abdominal pain. Delayed effects begin in 1-3 weeks after initial effects.  VAPOR Move to fresh air. If in eyes, hold eyelids open and flush with running water for 15 minutes. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes and isolate. If in eyes, flush with running water for at least 15 minutes; lift upper and lower eyelids occasionally. IF ON SKIN, wash with soap and mild detergent and flush with running water for at least 15 minutes. IF SWALLOWED and victim is conscious, have victim drink water and induce vomiting by touching back of throat with finger. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim quiet and maintain body temperature.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Esters  
2.2 Formula: (C<sub>7</sub>H<sub>7</sub>O)<sub>3</sub>PO  
2.3 IMO/IUN Designation: 6.1/2574  
2.4 DOT ID No.: 2574  
2.5 CAS Registry No.: 78-30-8  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear positive pressure breathing apparatus and special chemical protective clothing.
- 3.2 **Symptoms Following Exposure:** Transient gastro-intestinal upset accompanied by nausea, vomiting, diarrhea and abdominal pain, in 1-3 weeks after initial symptoms, soreness of the lower leg muscles and numbness of toes and fingers occur. Later weakness of the toes and bilateral wrist drop develop. Eyes: Contact may cause burns.
- 3.3 **Treatment of Exposure:** INHALATION: Get medical attention immediately. Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: In case of contact with material, immediately flush eyes with running water for at least 15 minutes, lifting the upper and lower eyelids occasionally. SKIN: Immediately wash contaminated skin with soap or mild detergent; continue to flush with running water for at least 15 minutes. Speed in removing material from the skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. INGESTION: If CONSCIOUS, give large quantities of water and induce vomiting by having the victim touch the back of his throat. If UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep the victim quiet and maintain normal body temperature.
- 3.4 **TLV-TWA:** 0.1 mg/m<sup>3</sup> (skin)
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 3.0 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Delayed neurotoxin. After a symptom-free period of 3 to 28 days following initial effects, paralysis, especially of the lower arms and legs, may develop. Recovery may take months or years; permanent residual effects occur in 25 to 30% of the cases.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Readily absorbed through the skin without local irritant effects. Not known to be an eye irritant.
- 3.11 **Liquid or Solid Characteristics:** Readily absorbed through the skin without local irritant effects. SKIN: TLV, 0.1 mg/m<sup>3</sup>; STEL: 0.3 mg/m<sup>3</sup>
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 40 mg/m<sup>3</sup> (skin)
- 3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 437°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: Dry chemical, CO<sub>2</sub>, water spray or foam. Large fires: Water spray, fog or foam (water or foam may cause frothing.)
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.
- 4.5 **Special Hazards of Combustion Products:** Contain highly toxic POx fumes.
- 4.6 **Behavior in Fire:** Can react with oxidizing materials. Produces poisonous gases upon combustion.
- 4.7 **Auto Ignition Temperature:** 725°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 123.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 32.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Will attack some forms of plastics, rubber and coatings.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Pressure vacuum
- 7.5 **IMO Pollution Category:** A
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 368.37
- 9.3 **Boiling Point at 1 atm:** 770°F = 410°C = 683.2°K
- 9.4 **Freezing Point:** -27°F = -33°C = 240.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.162 at 25°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 12.7
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRICRESYL PHOSPHATE (>= 1% ORTHO ISOMER)

TCO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	72.300		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# TRICRESYL PHOSPHATE (<1% ORTHO ISOMER)

TCP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> TCP Tri-p-cresyl phosphate Tri-p-tolyl phosphate	Liquid  Colorless  Odorless  Sinks in water.
Call fire department. Keep people away. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	LIQUID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: (p-CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>(O))<sub>3</sub>PO  
2.3 IMO/IUN Designation: Not listed  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 1330-78-5  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield.  
3.2 **Symptoms Following Exposure:** Vapors may irritate eyes, but only at high temperatures. Ingestion of liquid may cause severe damage to central nervous system and death if significant amounts of the toxic ortho-isomer are present.  
3.3 **Treatment of Exposure:** INGESTION: induce vomiting and call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (chicken LD<sub>50</sub> >2 g/kg)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. The compound is non-volatile for all practical purposes.  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 410°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 123.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 32.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Consists primarily of the para isomer, but several commercial grades may contain a significant proportion of tri-orthocresyl phosphate. Latter is considerably more toxic than the para-isomer if ingested.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 1  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 368  
9.3 **Boiling Point at 1 atm:** 770°F = 410°C = 683°K  
9.4 **Freezing Point:** -27°F = -33°C = 240°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.16 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 44 dynes/cm = 0.044 N/m at 25°C  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** (est.) 80.0 Btu/lb = 44.5 cal/g = 1.86 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRICRESYL PHOSPHATE (<1% ORTHO ISOMER)

TCP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	73.589	42	0.380		N	70	102.200
36	73.520	44	0.380		O	72	94.740
38	73.450	46	0.380		T	74	87.919
40	73.379	48	0.380			76	81.629
42	73.309	50	0.380		P	78	75.839
44	73.240	52	0.380		E	80	70.490
46	73.169	54	0.380		R	82	65.559
48	73.099	56	0.380		T	84	61.010
50	73.030	58	0.380		I	86	56.800
52	72.969	60	0.380		N	88	52.910
54	72.900	62	0.380		E	90	49.310
56	72.830	64	0.380		N	92	45.980
58	72.759	66	0.380		T	94	42.900
60	72.690	68	0.380			96	40.040
62	72.620	70	0.380			98	37.390
64	72.549	72	0.380			100	34.940
66	72.480	74	0.380			102	32.660
68	72.410	76	0.380			104	30.540
70	72.339	78	0.380				
72	72.270	80	0.380				
74	72.200	82	0.380				
76	72.129	84	0.380				
		86	0.380				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.000	310	0.019	310	0.00085		N
		320	0.026	320	0.00116		O
		330	0.036	330	0.00156		T
		340	0.049	340	0.00209		
		350	0.066	350	0.00278		P
		360	0.088	360	0.00366		E
		370	0.116	370	0.00479		R
		380	0.152	380	0.00623		T
		390	0.199	390	0.00803		I
		400	0.258	400	0.01030		N
		410	0.333	410	0.01312		E
		420	0.426	420	0.01661		N
		430	0.543	430	0.02092		T
		440	0.687	440	0.02618		
		450	0.865	450	0.03260		
		460	1.083	460	0.04038		
		470	1.349	470	0.04976		
		480	1.673	480	0.06103		
		490	2.064	490	0.07449		
		500	2.534	500	0.09052		
		510	3.098	510	0.10950		
		520	3.770	520	0.13190		
		530	4.569	530	0.15830		
		540	5.515	540	0.18910		
		550	6.631	550	0.22510		
		560	7.942	560	0.26700		



# TRICHLOROSILANE

TCS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Silicocloloroform Trichloromonosilane	Liquid  Colorless  Sharp choking odor  Reacts violently with water. Irritating gas is produced on contact with water. Boiling point is 90°F.
Evacuate. Keep people away. Avoid contact with liquid. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE. DO NOT USE WATER ON ADJACENT FIRES. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{SiHCl}_3$   
2.3 IMO/UN Designation: 4.3/1295  
2.4 DOT ID No.: 1295  
2.5 CAS Registry No.: 10025-78-2  
2.6 NAERG Guide No.: 139  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Acid-vapor-type respiratory protection; rubber gloves; chemical worker's goggles; other protective equipment as necessary to protect skin and eyes.  
3.2 **Symptoms Following Exposure:** Inhalation causes severe irritation of respiratory system. Liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; if breathing is difficult or stopped, give artificial respiration; call physician. EYES or SKIN: flush with plenty of water immediately for at least 15 min. and get medical attention. INGESTION: do NOT induce vomiting; give large amount of water; get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $\text{LD}_{50} = 1,000 \text{ mg/kg}$  (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  $-18^\circ\text{F}$  O.C.,  $>-58^\circ\text{F}$  C.C.  
4.2 **Flammable Limits in Air:** 1.2%-90.5%  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam  
4.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene gases may form in fires.  
4.6 **Behavior in Fire:** Difficult to extinguish; re-ignition may occur. Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:**  $220^\circ\text{F}$   
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 4.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 3.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently to form hydrogen chloride fumes (hydrochloric acid).  
5.2 **Reactivity with Common Materials:** Reacts with surface moisture to form hydrochloric acid, which corrodes common metals and forms flammable hydrogen gas.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Dangerous When Wet  
8.2 **49 CFR Class:** 4.3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	4
Instability (Yellow).....	2
Special (White).....	W

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at  $15^\circ\text{C}$  and 1 atm:** Liquid  
9.2 **Molecular Weight:** 135.5  
9.3 **Boiling Point at 1 atm:**  $90^\circ\text{F} = 32^\circ\text{C} = 305^\circ\text{K}$   
9.4 **Freezing Point:**  $-197^\circ\text{F} = -127^\circ\text{C} = 146^\circ\text{K}$   
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.344 at  $20^\circ\text{C}$  (liquid)  
9.8 **Liquid Surface Tension:** (est.) 18.3 dynes/cm = 0.0183 N/m at  $20^\circ\text{C}$   
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 4.9  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 85 Btu/lb = 47 cal/g =  $2.0 \times 10^5 \text{ J/kg}$   
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRICHLOROSILANE

TCS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
28	86.610	51	0.230	51	0.887	28	0.406
30	86.469	52	0.230	52	0.887	30	0.401
32	86.330	53	0.230	53	0.887	32	0.397
34	86.190	54	0.230	54	0.887	34	0.393
36	86.040	55	0.230	55	0.887	36	0.388
38	85.900	56	0.230	56	0.887	38	0.384
40	85.759	57	0.230	57	0.887	40	0.380
42	85.620	58	0.230	58	0.887	42	0.376
44	85.469	59	0.230	59	0.887	44	0.372
46	85.330	60	0.230	60	0.887	46	0.368
48	85.190	61	0.230	61	0.887	48	0.364
50	85.040	62	0.230	62	0.887	50	0.361
52	84.900	63	0.230	63	0.887	52	0.357
54	84.759	64	0.230	64	0.887	54	0.353
56	84.610	65	0.230	65	0.887	56	0.350
58	84.469	66	0.230	66	0.887	58	0.346
60	84.330	67	0.230	67	0.887	60	0.343
62	84.179	68	0.230	68	0.887	62	0.339
64	84.040	69	0.230	69	0.887	64	0.336
66	83.900	70	0.230	70	0.887	66	0.333
68	83.750	71	0.230	71	0.887	68	0.330
70	83.610	72	0.230	72	0.887	70	0.327
72	83.459	73	0.230	73	0.887	72	0.323
74	83.320	74	0.230	74	0.887	74	0.320
76	83.169	75	0.230	75	0.887	76	0.317
78	83.030	76	0.230	76	0.887	78	0.314

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	-70	0.160	-70	0.00519		N
	E	-60	0.236	-60	0.00746		O
	A	-50	0.342	-50	0.01054		T
	C	-40	0.487	-40	0.01464		
	T	-30	0.681	-30	0.02000		P
	S	-20	0.938	-20	0.02694		E
		-10	1.275	-10	0.03579		R
		0	1.709	0	0.04693		T
		10	2.263	10	0.06081		I
		20	2.961	20	0.07791		N
		30	3.832	30	0.09878		E
		40	4.908	40	0.12400		N
		50	6.227	50	0.15420		T
		60	7.827	60	0.19010		
		70	9.753	70	0.23240		
		80	12.060	80	0.28200		
		90	14.790	90	0.33960		

# TRICHLORO-S-TRIAZINETRIONE

TCT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Trichloroiminoisocyanuric acid Trichloroisocyanuric acid Trichlorotriazinetrione Trichloro-s-triazine-2,4,6-(1h, 3h, 5h)-trione	Solid  White  Bleach-like odor  Sinks and mixes slowly with water.
<b>Keep people away. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Wear goggles and self-contained breathing apparatus. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment: Burn;  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Cl<sub>3</sub>(NCO)<sub>3</sub>  
2.3 IMO/UN Designation: 5.1/12468  
2.4 DOT ID No.: 2468  
2.5 CAS Registry No.: 87-90-1  
2.6 NAERG Guide No.: 141  
2.7 Standard Industrial Trade Classification: 51577

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask or chlorine canister mask; goggles; rubber gloves  
3.2 **Symptoms Following Exposure:** Inhalation causes sneezing and coughing. Contact with dust causes moderate irritation of eyes and itching and redness of skin. Ingestion causes burns of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. EYES: irrigate with running water for 15 min.; call physician. SKIN: flush with water. INGESTION: induce vomiting and call physician.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 750 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable but may cause fire on contact with ordinary combustibles  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water in large amounts  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic chlorine or nitrogen trichloride may be formed in fires.  
4.6 **Behavior in Fire:** Containers may explode when heated.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts to form a bleach solution. The reaction is not hazardous.  
5.2 **Reactivity with Common Materials:**  
Contact with most foreign material, organic matter, or easily chlorinated or oxidized materials may result in fire. Avoid oil, grease, sawdust, floor sweepings, other easily oxidized organic compounds.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 39-90% available chlorine  
7.2 **Storage Temperature:** Ambient Avoid elevated temperatures.  
7.3 **Inert Atmosphere:** No requirement if dry  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer  
8.2 49 CFR Class: 5.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	2
Special (White).....	OX

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 232.5  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) >1 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRICHLORO-S-TRIAZINETRIONE

TCT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	1.200		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# TOLUENEDIAMINE

TDA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,4-Diaminotoluene 2,4-Tolamine 2,4-Toluenediamine m-Toluene diamine meta-Toluenediamine 4-m-Tolylenediamine	Crystalline solid      Colorless  Floats and mixes with water.
<b>Keep people away.</b> <b>Shut off ignition sources. Call fire department.</b> <b>Avoid contact with solid and dust.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. Toxic gases are produced when heated to decomposition temperature. Wear goggles, protective overclothing (including hat, gloves, and rubber footwear), and dust-acid gas respirator. Extinguish with water, carbon dioxide, alcohol foam or dry chemical.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Toxic by inhalation, skin absorption, and ingestion. Irritating to eyes and skin. If in eyes, hold eyelids open and flush with water for at least 15 minutes. If on skin, remove clothing and shower thoroughly with soap and water and put on clean clothing.  SOLID Irritating to eyes and skin. Toxic if swallowed. IF IN EYES, hold eyelids open and flush with plenty of water for at least 15 minutes. If on skin, remove clothing and shower thoroughly with soap and water. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 9; Aromatic amine  
2.2 **Formula:**  $\text{CH}_3\text{C}_6\text{H}_4(\text{NH}_2)_2$   
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** 1709  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 151  
2.7 **Standard Industrial Trade Classification:** 51452

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Hat and goggles, respirator with combination dust-acid- gas-organic vapor cartridge, gauntlet vinyl gloves taped to jacket, and long sleeved underwear, vinyl apron and rubber footwear.
- 3.2 **Symptoms Following Exposure:** Toxic by dust inhalation, skin absorption, and ingestion. It can cause conjunctivitis and corneal opacities, irritation and blistering of the skin, nausea, and vomiting.
- 3.3 **Treatment of Exposure:** INHALATION: Move to fresh air. EYES: Hold eyelids open and flush with plenty of water for at least 15 minutes; get prompt medical attention. SKIN: Remove clothing, shower thoroughly with soap and water, put on clean clothing and get prompt medical attention.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50} = 100 \text{ mg/kg}$   
3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Caused cancer in rats and female mice in feeding studies. It possesses mutagenic activities and it causes fatty degeneration of the liver. It was found to induce liver tumors in rats when fed at levels up to one percent in the diet. It causes jaundice and anemia. This compound is extremely dangerous.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Irritates eyes and skin, and it can cause skin blistering in sensitive individuals.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 410°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, carbon dioxide, alcohol foam or dry chemicals.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Toxic fumes are generated when heated.  
4.6 **Behavior in Fire:** Toxic gases are produced when heated to decomposition temperature.  
4.7 **Auto Ignition Temperature:** Above 887°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 54.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Reacts vigorously with oxidizing agents.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Data not available.  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98-99+ percent  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 10 pounds  
8.7 **EPA Pollution Category:** A  
8.8 **RCRA Waste Number:** U221  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 122.17  
9.3 **Boiling Point at 1 atm:** 536°F = 280°C = 553°K  
9.4 **Freezing Point:** 210°F = 99°C = 372°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.0  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Not pertinent

### NOTES

# TOLUENEDIAMINE

TDA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# TETRADECYLBENZENE

TDB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Phenyltetradecane	Liquid                      Colorless                      Mild odor  Floats on water.
Keep people away. Avoid contact with liquid and solid. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment:  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 32; Aromatic Hydrocarbon  
 2.2 **Formula:** C<sub>15</sub>H<sub>12</sub>(CH<sub>2</sub>)<sub>13</sub>CH<sub>3</sub>  
 2.3 **IMO/UN Designation:** Not listed  
 2.4 **DOT ID No.:** Not listed  
 2.5 **CAS Registry No.:** Currently not available  
 2.6 **NAERG Guide No.:** Not listed  
 2.7 **Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves  
 3.2 **Symptoms Following Exposure:** Ingestion may cause intestinal disturbances. Contact with eyes causes mild irritation.  
 3.3 **Treatment of Exposure:** INGESTION: induce vomiting if large amount has been swallowed. EYES: flush with water. SKIN: wipe off; wash with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
 4.5 **Special Hazards of Combustion Products:** Currently not available  
 4.6 **Behavior in Fire:** Currently not available  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 4.42 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 135.7 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 37.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** May attack some forms of plastics  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 0  
 Human Oral hazard: -  
 Human Contact hazard: -  
 Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** D  
 7.6 **Ship Type:** Data not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
 9.2 **Molecular Weight:** 274.47  
 9.3 **Boiling Point at 1 atm:** 678°F = 359°C = 632°K  
 9.4 **Freezing Point:** 61°F = 16°C = 289°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.855 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 30.27 dynes/cm = 0.03027 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** 95.18 Btu/lb = 52.88 cal/g = 2.212 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -18,430 Btu/lb = -10,240 cal/g = -428.4 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TETRADECYL BENZENE

TDB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
61	53.540	61	0.360	61	1.048	70	7.424
62	53.520	62	0.360	62	1.048	75	6.893
63	53.490	63	0.360	63	1.048	80	6.409
64	53.470	64	0.360	64	1.048	85	5.967
65	53.440	65	0.360	65	1.048	90	5.563
66	53.420	66	0.360	66	1.048	95	5.193
67	53.390	67	0.360	67	1.048	100	4.853
68	53.370	68	0.360	68	1.048	105	4.541
69	53.350	69	0.360	69	1.048	110	4.254
70	53.320	70	0.360	70	1.048	115	3.989
71	53.300	71	0.360	71	1.048	120	3.746
72	53.270	72	0.360	72	1.048	125	3.520
73	53.250	73	0.360	73	1.048	130	3.312
74	53.220	74	0.360	74	1.048	135	3.120
75	53.200	75	0.360	75	1.048	140	2.941
76	53.180	76	0.360	76	1.048		
77	53.150	77	0.360	77	1.048		
78	53.130						
79	53.100						
80	53.080						
81	53.050						
82	53.030						
83	53.010						
84	52.980						
85	52.960						
86	52.930						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



## 1-TRIDECENE

TDC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Undecylethylene	Watery liquid Colorless Mild pleasant odor  Floats on water.
Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	LIQUID Irritating to eyes. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_{10}\text{CH}=\text{CH}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification:  
51119

## 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield.  
3.2 Symptoms Following Exposure: Liquid may irritate eyes.  
3.3 Treatment of Exposure: EYES: flush with water for 15 min.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Non-volatile  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

4.1 Flash Point:  
175°F (approx.)  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 92.8 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 26.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

6.1 Aquatic Toxicity:  
Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD):  
Currently not available  
6.4 Food Chain Concentration Potential:  
None  
6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

7.1 Grades of Purity: Technical: 95%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 182.35  
9.3 Boiling Point at 1 atm: 451°F = 233°C = 506°K  
9.4 Freezing Point: -11°F = -24°C = 249°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.765 at 20°C (liquid)  
9.8 Liquid Surface Tension: 24.5 dynes/cm = 0.0245 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.029  
9.12 Latent Heat of Vaporization: 110 Btu/lb = 59 cal/g =  $2.5 \times 10^5$  J/kg  
9.13 Heat of Combustion: -19,048 Btu/lb = -10,582 cal/g =  $-443.05 \times 10^5$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Low

NOTES

# 1-TRIDECENE

TDC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	48.620	35	0.499	32	1.040	15	3.203
40	48.500	40	0.499	34	1.040	20	2.988
45	48.370	45	0.499	36	1.040	25	2.791
50	48.250	50	0.499	38	1.040	30	2.611
55	48.130	55	0.499	40	1.040	35	2.446
60	48.010	60	0.499	42	1.040	40	2.294
65	47.890	65	0.499	44	1.040	45	2.154
70	47.770	70	0.499	46	1.040	50	2.026
75	47.650	75	0.499	48	1.040	55	1.907
80	47.520	80	0.499	50	1.040	60	1.797
85	47.400	85	0.499	52	1.040	65	1.696
90	47.280	90	0.499	54	1.040	70	1.602
95	47.160	95	0.499	56	1.040	75	1.515
100	47.040	100	0.499	58	1.040	80	1.434
		105	0.499	60	1.040	85	1.359
		110	0.499	62	1.040		
		115	0.499	64	1.040		
		120	0.499	66	1.040		
				68	1.040		
				70	1.040		
				72	1.040		
				74	1.040		
				76	1.040		
				78	1.040		
				80	1.040		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	130	0.009	130	0.00027	0	0.347
	N	140	0.014	140	0.00040	25	0.360
	S	150	0.020	150	0.00057	50	0.374
	O	160	0.029	160	0.00080	75	0.387
	L	170	0.042	170	0.00112	100	0.401
	U	180	0.058	180	0.00154	125	0.414
	B	190	0.079	190	0.00208	150	0.428
	L	200	0.108	200	0.00277	175	0.441
	E	210	0.144	210	0.00366	200	0.454
		220	0.191	220	0.00477	225	0.467
		230	0.250	230	0.00615	250	0.480
		240	0.324	240	0.00786	275	0.493
		250	0.415	250	0.00994	300	0.505
		260	0.528	260	0.01246	325	0.518
		270	0.665	270	0.01548	350	0.531
		280	0.831	280	0.01909	375	0.543
		290	1.031	290	0.02336	400	0.556
		300	1.269	300	0.02837	425	0.568
						450	0.580
						475	0.592
						500	0.605
						525	0.617
						550	0.628
						575	0.640
						600	0.652

# TOLUENE 2,4-DIISOCYANATE

TDI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hylyene T Mondur TDS Nacconate 100 TDI 2,4-Tolylene diisocyanate	Liquid  Colorless to light yellow  Sharp, sweet, fruity odor  Sinks and reacts with water. Freezing point is 68°F - 72°F.
Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GAS IS PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical or carbon dioxide. Water and foam may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 12; Isocyanates
- 2.2 Formula: 1-CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>(NCO)<sub>2</sub>-2, 4
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2078
- 2.5 CAS Registry No.: 584-84-9
- 2.6 NAERG Guide No.: 156
- 2.7 Standard Industry Trade Classification: 51489

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor canister; goggles or face shield; rubber gloves, boots and apron.
- 3.2 **Symptoms Following Exposure:** Irritates eyes and skin. Potent sensitizer and lung irritant if inhaled. May produce bronchospasm (asthma), pneumonitis, bronchitis, and pulmonary edema. Nocturnal cough and shortness of breath are common. Repeated low-level exposure may produce chronic lung disease. Oral toxicity is low.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; administer artificial respiration and oxygen if needed; call a doctor at once. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min.; call a doctor at once. SKIN: flush with water; wipe off; wipe with rubbing alcohol; wash with soap and water.
- 3.4 **TLV-TWA:** 0.005 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 0.02 ppm
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second- degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** 0.4-2.14 ppm
- 3.13 **IDLH Value:** 2.5 ppm
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** 0.02 ppm
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 270°F O.C.
- 4.2 **Flammable Limits in Air:** 0.9%-9.5%
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** >300
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 54.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)
- 4.14 **Maximum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity in Water:** Forms carbon dioxide gas and an organic base; the reaction is not violent.
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Cautics:** Not pertinent
- 5.5 **Polymerization:** Slow, not hazardous, above 113°F
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial distilled, 99% total diisocyanate. The following isomer ratios are shipped: (a) 100% 2, 4-; (b) 80% 2, 4-; 20% 2, 6- (most common); (c) 65% 2, 4-; 35% 2, 6-. All mixtures have similar characteristics.
- 7.2 **Storage Temperature:** 75-100°F
- 7.3 **Inert Atmosphere:** Inerted
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	1
Special (White).....	W
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U223
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 174.16
- 9.3 **Boiling Point at 1 atm:** 482°F = 250°C = 523°K
- 9.4 **Freezing Point:** 68-72°F = 20-22°C = 293-295°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.22 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 25°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 45 dynes/cm = 0.045 N/m at 25°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -10,000 Btu/lb = -5720 cal/g = -239 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Low

### NOTES

# TOLUENE 2,4-DIISOCYANATE

TDI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
80	76.049	85	0.398	77	1.179	68	5.770
85	75.879	90	0.400	78	1.179	69	5.623
90	75.700	95	0.402	79	1.179	70	5.481
95	75.530	100	0.403	80	1.179	71	5.342
100	75.360	105	0.405	81	1.179	72	5.207
105	75.179	110	0.407	82	1.179	73	5.077
110	75.009	115	0.409	83	1.179	74	4.950
115	74.839	120	0.411	84	1.179	75	4.826
120	74.660	125	0.413	85	1.179	76	4.707
125	74.490	130	0.415	86	1.179	77	4.590
130	74.320	135	0.417	87	1.179	78	4.477
135	74.139	140	0.419	88	1.179	79	4.367
140	73.969	145	0.421	89	1.179	80	4.260
		150	0.423	90	1.179	81	4.156
				91	1.179	82	4.056
				92	1.179	83	3.957
				93	1.179	84	3.862
				94	1.179	85	3.769
				95	1.179		
				96	1.179		
				97	1.179		
				98	1.179		
				99	1.179		
				100	1.179		
				101	1.179		
				102	1.179		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	130	0.004	130	0.00011		N
	N	140	0.006	140	0.00015		O
	S	150	0.008	150	0.00022		T
	O	160	0.012	160	0.00031		
	L	170	0.017	170	0.00044		P
	U	180	0.024	180	0.00060		E
	B	190	0.033	190	0.00082		R
	I	200	0.045	200	0.00112		T
	E	210	0.062	210	0.00150		I
		220	0.084	220	0.00199		N
		230	0.112	230	0.00263		E
		240	0.149	240	0.00344		N
		250	0.196	250	0.00447		T
		260	0.256	260	0.00577		
		270	0.332	270	0.00738		
		280	0.428	280	0.00938		
		290	0.547	290	0.01184		
		300	0.696	300	0.01486		

# TOLUENE 2,4-DIISOCYANATE

TDI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hylyene T Mondur TDS Nacconate 100 TDI 2,4-Tolylene diisocyanate	Liquid  Colorless to light yellow  Sharp, sweet, fruity odor  Sinks and reacts with water. Freezing point is 68°F - 72°F.
Keep people away. AVOID CONTACT WITH LIQUID AND VAPOR. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GAS IS PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical or carbon dioxide. Water and foam may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID. POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 12; Isocyanate
- 2.2 Formula: 1-CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>(NCO)<sub>2</sub>-2, 4
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2078
- 2.5 CAS Registry No.: 584-84-9
- 2.6 NAERG Guide No.: 156
- 2.7 Standard Industrial Trade Classification: 51489

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor canister; goggles or face shield; rubber gloves, boots and apron.
- 3.2 **Symptoms Following Exposure:** Irritates eyes and skin. Potent sensitizer and lung irritant if inhaled. May produce bronchospasm (asthma), pneumonitis, bronchitis, and pulmonary edema. Nocturnal cough and shortness of breath are common. Repeated low-level exposure may produce chronic lung disease. Oral toxicity is low.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; administer artificial respiration and oxygen if needed; call a doctor at once. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min.; call a doctor at once. SKIN: flush with water; wipe off; wipe with rubbing alcohol; wash with soap and water.
- 3.4 **TLV-TWA:** 0.005 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 0.02 ppm
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second- degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** 0.4-2.14 ppm
- 3.13 **IDLH Value:** 2.5 ppm
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** 0.02 ppm
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 270°F O.C.
- 4.2 **Flammable Limits in Air:** 0.9%-9.5%
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** >300
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 54.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Forms carbon dioxide gas and an organic base; the reaction is not violent.
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Cautics:** Not pertinent
- 5.5 **Polymerization:** Slow, not hazardous, above 113°F
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial distilled, 99% total diisocyanate. The following isomer ratios are shipped: (a) 100% 2, 4-; (b) 80% 2, 4-; 20% 2, 6- (most common); (c) 65% 2, 4-; 35% 2, 6-. All mixtures have similar characteristics.
- 7.2 **Storage Temperature:** 75-100°F
- 7.3 **Inert Atmosphere:** Inerted
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** 1

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	1
Special (White).....	W
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U223
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 174.16
- 9.3 **Boiling Point at 1 atm:** 482°F = 250°C = 523°K
- 9.4 **Freezing Point:** 68-72°F = 20-22°C = 293-295°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.22 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 25°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 45 dynes/cm = 0.045 N/m at 25°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -10,000 Btu/lb = -5720 cal/g = -239 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Low

### NOTES

# TOLUENE 2,4-DIISOCYANATE

TDI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
80	76.049	85	0.398	77	1.179	68	5.770
85	75.879	90	0.400	78	1.179	69	5.623
90	75.700	95	0.402	79	1.179	70	5.481
95	75.530	100	0.403	80	1.179	71	5.342
100	75.360	105	0.405	81	1.179	72	5.207
105	75.179	110	0.407	82	1.179	73	5.077
110	75.009	115	0.409	83	1.179	74	4.950
115	74.839	120	0.411	84	1.179	75	4.826
120	74.660	125	0.413	85	1.179	76	4.707
125	74.490	130	0.415	86	1.179	77	4.590
130	74.320	135	0.417	87	1.179	78	4.477
135	74.139	140	0.419	88	1.179	79	4.367
140	73.969	145	0.421	89	1.179	80	4.260
		150	0.423	90	1.179	81	4.156
				91	1.179	82	4.056
				92	1.179	83	3.957
				93	1.179	84	3.862
				94	1.179	85	3.769
				95	1.179		
				96	1.179		
				97	1.179		
				98	1.179		
				99	1.179		
				100	1.179		
				101	1.179		
				102	1.179		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	130	0.004	130	0.00011		N
	N	140	0.006	140	0.00015		O
	S	150	0.008	150	0.00022		T
	O	160	0.012	160	0.00031		
	L	170	0.017	170	0.00044		P
	U	180	0.024	180	0.00060		E
	B	190	0.033	190	0.00082		R
	I	200	0.045	200	0.00112		T
	E	210	0.062	210	0.00150		I
		220	0.084	220	0.00199		N
		230	0.112	230	0.00263		E
		240	0.149	240	0.00344		N
		250	0.196	250	0.00447		T
		260	0.256	260	0.00577		
		270	0.332	270	0.00738		
		280	0.428	280	0.00938		
		290	0.547	290	0.01184		
		300	0.696	300	0.01486		

# TRIDECANOL

TDN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isotridecanol Isotridecyl alcohol Oxotridecyl alcohol 1-Tridecanol	Oily liquid                      Colorless                      Mild, pleasant odor  Floats on water.
Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical or alcohol foam. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Not harmful.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 20; Alcohol, glycol  
**2.2 Formula:** C<sub>12</sub>H<sub>25</sub>CH<sub>2</sub>OH  
**2.3 IMO/UN Designation:** Not listed  
**2.4 DOT ID No.:** Not listed  
**2.5 CAS Registry No.:** Currently not available  
**2.6 NAERG Guide No.:** Not listed  
**2.7 Standard Industrial Trade Classification:** 51219

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Synthetic rubber gloves; chemical goggles.  
**3.2 Symptoms Following Exposure:** Inhalation hazard slight. Skin contact results in moderate irritation. Liquid contact with eyes causes severe irritation and possible eye damage.  
**3.3 Treatment of Exposure:** EYES: promptly flush with clean water for at least 15 min. and see a physician. SKIN: wash exposed area with soap and water.  
**3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Currently not available  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.  
**3.11 Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 250°F O.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Alcohol foam, dry chemical, water fog  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Not pertinent  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 92.8 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 27.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:**  
   Bioaccumulation: 0  
   Damage to living resources: 0  
   Human Oral hazard: 0  
   Human Contact hazard: 0  
   Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Mixed isomers; 99+%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester)  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed  
**8.2 49 CFR Class:** Not pertinent  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  
   Category                      Classification  
   Health Hazard (Blue)..... 0  
   Flammability (Red)..... 1  
   Instability (Yellow)..... 0  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 200.37  
**9.3 Boiling Point at 1 atm:** 525°F = 274°C = 547°K  
**9.4 Freezing Point:** Not pertinent  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 0.846 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** 1.027  
**9.12 Latent Heat of Vaporization:** 120 Btu/lb = 64 cal/g = 2.7 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** (est.) -12,200 Btu/lb = -6,790 cal/g = -284 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Low

### NOTES

# TRIDECANOL

TDN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	53.730	85	0.565	68	1.109	68	50.000
40	53.590	90	0.573	69	1.109		
45	53.450	95	0.581	70	1.109		
50	53.310	100	0.589	71	1.109		
55	53.170	105	0.597	72	1.109		
60	53.030	110	0.605	73	1.109		
65	52.890	115	0.613	74	1.109		
70	52.750	120	0.621	75	1.109		
75	52.620	125	0.629	76	1.109		
80	52.480	130	0.637	77	1.109		
85	52.340	135	0.645	78	1.109		
90	52.200	140	0.654	79	1.109		
95	52.060	145	0.662	80	1.109		
		150	0.670	81	1.109		
				82	1.109		
				83	1.109		
				84	1.109		
				85	1.109		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	260	0.070	260	0.00182	0	0.333
	N	280	0.131	280	0.00331	25	0.347
	S	300	0.232	300	0.00571	50	0.361
	O	320	0.393	320	0.00941	75	0.376
	L	340	0.637	340	0.01488	100	0.390
	U	360	0.996	360	0.02269	125	0.403
	B	380	1.507	380	0.03350	150	0.417
	L	400	2.214	400	0.04806	175	0.431
	E	420	3.167	420	0.06720	200	0.444
		440	4.425	440	0.09180	225	0.457
		460	6.051	460	0.12280	250	0.470
		480	8.116	480	0.16120	275	0.483
		500	10.690	500	0.20800	300	0.496
		520	13.870	520	0.26420	325	0.508
		540	17.720	540	0.33080	350	0.521
		560	22.330	560	0.40880	375	0.533
						400	0.545
						425	0.557
						450	0.568
						475	0.580
						500	0.591
						525	0.602
						550	0.614
						575	0.624
						600	0.635



# TRIETHANOLAMINE

TEA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Tris(Hydroxyethyl)amine Triethylolamine Trihydroxytriethylamine	Oily liquid                      Colorless                      Mild ammonia odor  Sinks and mixes with water. Freezing point is 71°F.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 8; Alkanolamine
- 2.2 Formula: (HOCH<sub>2</sub>CH<sub>2</sub>)<sub>3</sub>N
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 102-71-6
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; rubber gloves and boots.
- 3.2 Symptoms Following Exposure: Liquid may irritate eyes and skin.
- 3.3 Treatment of Exposure: EYES: flush with water for at least 15 min.; call a doctor. SKIN: wipe off, wash with soap and water.
- 3.4 TLV-TWA: 5 mg/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (guinea pig).
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Non-volatile
- 3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 375°F O.C. 355°F C.C.
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.
- 4.5 Special Hazards of Combustion Products: Poisonous gases, such as NOx, may be produced
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 44.0 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 14.5 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 85-99%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: D
- 7.6 Ship Type: 3
- 7.7 Barge Hull Type: 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	1 2
Flammability (Red).....	1 1
Instability (Yellow).....	1 1
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Dilute with water
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 149.19
- 9.3 Boiling Point at 1 atm: Decomposes
- 9.4 Freezing Point: 70.9°F = 21.6°C = 294.8°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.13 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): 1.036
- 9.12 Latent Heat of Vaporization: 176 Btu/lb = 97.8 cal/g = 4.10 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: -11,050 Btu/lb = -6140 cal/g = -257 X 10<sup>5</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: (est.) -20 Btu/lb = -12 cal/g = -0.5 X 10<sup>5</sup> J/kg
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Low

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: >100 ppm/48 hr/shrimp/LC<sub>50</sub>/salt water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): 1%, 5 days; 0%, 5 days; 6.2% (theor.), 20 days
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 1
  - Human Oral hazard: 0
  - Human Contact hazard: I
  - Reduction of amenities: 0

### NOTES

# TRIETHANOLAMINE

TEA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
72	70.400	72	0.489		N		N
74	70.330	74	0.490		O		O
76	70.259	76	0.491		T		T
78	70.190	78	0.492				
80	70.120	80	0.494		P		P
82	70.049	82	0.495		E		E
84	69.980	84	0.496		R		R
86	69.910	86	0.497		T		T
88	69.839				I		I
90	69.770				N		N
92	69.709				E		E
94	69.639				N		N
96	69.570				T		T
98	69.500						
100	69.429						
102	69.360						
104	69.290						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	320	0.020	320	0.00035	0	0.352
	I	340	0.037	340	0.00063	25	0.362
	S	360	0.065	360	0.00110	50	0.372
	C	380	0.111	380	0.00184	75	0.382
	I	400	0.185	400	0.00300	100	0.392
	B	420	0.300	420	0.00474	125	0.402
	L	440	0.473	440	0.00731	150	0.412
	E	460	0.729	460	0.01101	175	0.421
		480	1.098	480	0.01623	200	0.430
		500	1.620	500	0.02346	225	0.439
		520	2.347	520	0.03330	250	0.448
		540	3.340	540	0.04644	275	0.457
		560	4.677	560	0.06375	300	0.466
		580	6.451	580	0.08623	325	0.474
		600	8.770	600	0.11500	350	0.482
		620	11.770	620	0.15150	375	0.490
		640	15.590	640	0.19710	400	0.498
		660	20.420	660	0.25350	425	0.506
						450	0.514
						475	0.521
						500	0.528
						525	0.535
						550	0.542
						575	0.549
						600	0.556

# TRIETHYLBENZENE

TEB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,3,5-Triethylbenzene sym-Triethylbenzene	Liquid                      Colorless                      Weak chemical odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment:  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 32; Aromatic Hydrocarbon  
 2.2 **Formula:** C<sub>6</sub>H<sub>5</sub>(C<sub>2</sub>H<sub>5</sub>)<sub>3</sub>-1, 3, 5  
 2.3 **IMO/UN Designation:** Not listed  
 2.4 **DOT ID No.:** Not listed  
 2.5 **CAS Registry No.:** Currently not available  
 2.6 **NAERG Guide No.:** Not listed  
 2.7 **Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
 3.2 **Symptoms Following Exposure:** Eye irritation by vapors or liquid. Central nervous system depression. Prolonged skin contact with liquid can cause dermatitis.  
 3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min.; call a doctor. SKIN: wipe off, wash with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 181°F O.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 78.5 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 21.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Currently not available  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** A  
 7.6 **Ship Type:** 2  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** Yes  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	-
Flammability (Red).....	2
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 162.27  
 9.3 **Boiling Point at 1 atm:** 421°F = 216°C = 489°K  
 9.4 **Freezing Point:** Not pertinent  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 0.861 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** Currently not available  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.039  
 9.12 **Latent Heat of Vaporization:** (est.) 120 Btu/lb = 65 cal/g = 2.7 X 10<sup>3</sup> J/kg  
 9.13 **Heat of Combustion:** Currently not available  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 0.03 psia

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** Currently not available  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: T  
 Damage to living resources: 4  
 Human Oral hazard: 0  
 Human Contact hazard: 0  
 Reduction of amenities: 0

### NOTES

# TRIETHYLBENZENE

TEB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	54.240	42	0.478	41	1.040	41	2.880
54	54.170	44	0.478	42	1.040	42	2.837
56	54.100	46	0.478	43	1.040	43	2.795
58	54.030	48	0.478	44	1.040	44	2.753
60	53.960	50	0.478	45	1.040	45	2.712
62	53.890	52	0.478	46	1.040	46	2.673
64	53.820	54	0.478	47	1.040	47	2.633
66	53.750	56	0.478	48	1.040	48	2.595
68	53.680	58	0.478	49	1.040	49	2.557
70	53.610	60	0.478	50	1.040	50	2.520
72	53.540	62	0.478	51	1.040	51	2.484
74	53.480	64	0.478	52	1.040	52	2.448
76	53.410	66	0.478	53	1.040	53	2.413
78	53.340	68	0.478	54	1.040	54	2.379
80	53.270	70	0.478	55	1.040	55	2.345
82	53.200	72	0.478	56	1.040	56	2.312
84	53.130	74	0.478	57	1.040	57	2.279
86	53.060	76	0.478	58	1.040	58	2.247
88	52.990			59	1.040	59	2.216
90	52.920			60	1.040	60	2.185
92	52.850			61	1.040	61	2.155
94	52.780			62	1.040	62	2.125
96	52.710			63	1.040	63	2.096
98	52.640			64	1.040	64	2.067
100	52.570			65	1.040	65	2.039
102	52.500			66	1.040	66	2.011

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	120	0.023	120	0.00060	0	0.289
	N	140	0.044	140	0.00112	25	0.303
	S	160	0.081	160	0.00198	50	0.316
	O	180	0.142	180	0.00336	75	0.330
	L	200	0.240	200	0.00549	100	0.343
	U	220	0.390	220	0.00868	125	0.356
	B	240	0.617	240	0.01333	150	0.369
	I	260	0.947	260	0.01989	175	0.382
	E	280	1.418	280	0.02897	200	0.395
		300	2.073	300	0.04125	225	0.407
		320	2.967	320	0.05753	250	0.419
		340	4.164	340	0.07871	275	0.432
		360	5.739	360	0.10580	300	0.443
		380	7.779	380	0.14000	325	0.455
		400	10.380	400	0.18260	350	0.467
		420	13.660	420	0.23480	375	0.478
						400	0.489
						425	0.501
						450	0.511
						475	0.522
						500	0.533
						525	0.543
						550	0.553
						575	0.563
						600	0.573

# TETRACHLOROETHANE

TEC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetylene tetrachloride 1,1,2,2-Tetrachloroethane	Liquid  Colorless to pale yellow  Sweet odor  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Poisonous gases may be produced when heated.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 36; Halogenated hydrocarbon  
2.2 **Formula:** Cl<sub>2</sub>CHCHCl<sub>2</sub>  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** 1702  
2.5 **CAS Registry No.:** 1299-90-7  
2.6 **NAERG Guide No.:** 151  
2.7 **Standard Industrial Trade Classification:** 51134

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles; plastic face shield; air- or oxygen-supplied mask; safety hat with brim; solvent-proof apron; synthetic rubber gloves
- 3.2 **Symptoms Following Exposure:** Compound is a powerful narcotic and liver poison; may also cause changes in blood composition and neurological disturbances. Repeated exposure by inhalation can be fatal. Ingestion causes vomiting, diarrhea, severe mucosal injury, liver necrosis, cyanosis, unconsciousness, loss of reflexes, and death. Contact with eyes causes irritation and lachrymation. Can be absorbed through the skin and may produce severe skin lesions.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; begin artificial respiration if breathing has ceased. INGESTION: induce vomiting; call a physician. EYES: irrigate with water for 15 min. SKIN: remove clothing; wash skin thoroughly with warm water and soap.
- 3.4 **TLV-TWA:** 1 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral LD<sub>50</sub> = 200 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Liver poisoning, nervous disorders  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.5 ppm  
3.13 **IDLH Value:** 100 ppm  
3.14 **OSHA PEL-TWA:** 5 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
**Products:** Irritating hydrogen chloride vapor may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** May attack some forms of plastics
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
**Bioaccumulation:** Z  
**Damage to living resources:** 2  
**Human Oral hazard:** 2  
**Human Contact hazard:** II  
**Reduction of amenities:** X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 98%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U209
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 167.85
- 9.3 **Boiling Point at 1 atm:** 295.3°F = 146.3°C = 419.5°K
- 9.4 **Freezing Point:** -46.8°F = -43.8°C = 229.4°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.595 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 37.85 dynes/cm = 0.03785 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 5.79
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.090 at 25°C
- 9.12 **Latent Heat of Vaporization:** 89.2 Btu/lb = 55.1 cal/g = 2.30 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.5 psia

### NOTES

# TETRACHLOROETHANE

TEC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	101.400	52	0.210	30	0.791	34	2.527
36	101.299	54	0.210	40	0.784	36	2.473
38	101.200	56	0.210	50	0.777	38	2.422
40	101.099	58	0.210	60	0.770	40	2.371
42	101.000	60	0.210	70	0.763	42	2.322
44	100.900	62	0.210	80	0.756	44	2.275
46	100.799	64	0.210	90	0.748	46	2.229
48	100.599	66	0.210	100	0.741	48	2.184
50	100.500	68	0.210	110	0.734	50	2.140
52	100.400	70	0.210	120	0.727	52	2.098
54	100.299	72	0.210	130	0.720	54	2.057
56	100.200	74	0.210	140	0.713	56	2.017
58	100.099	76	0.210	150	0.706	58	1.977
60	100.000	78	0.210	160	0.699	60	1.939
62	99.910	80	0.210	170	0.692	62	1.902
64	99.799	82	0.210	180	0.685	64	1.866
66	99.690	84	0.210	190	0.678	66	1.831
68	99.589	86	0.210	200	0.671	68	1.797
70	99.480					70	1.764
72	99.379					72	1.732
74	99.270					74	1.700
76	99.160					76	1.669
78	99.059					78	1.639
80	98.950					80	1.610
82	98.849					82	1.582
84	98.740					84	1.554

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.251	80	0.161	80	0.00468	90	0.145
36	0.252	90	0.216	90	0.00614	100	0.146
38	0.254	100	0.285	100	0.00797	110	0.148
40	0.256	110	0.374	110	0.01026	120	0.149
42	0.258	120	0.485	120	0.01309	130	0.150
44	0.259	130	0.624	130	0.01655	140	0.151
46	0.261	140	0.796	140	0.02076	150	0.153
48	0.263	150	1.008	150	0.02584	160	0.154
50	0.265	160	1.265	160	0.03193	170	0.155
52	0.266	170	1.578	170	0.03918	180	0.156
54	0.268	180	1.954	180	0.04776	190	0.157
56	0.270	190	2.403	190	0.05784	200	0.159
58	0.272	200	2.938	200	0.06964	210	0.160
60	0.273	210	3.570	210	0.08335	220	0.161
62	0.275	220	4.313	220	0.09922	230	0.162
64	0.277	230	5.182	230	0.11750	240	0.164
66	0.279	240	6.194	240	0.13840	250	0.165
68	0.280	250	7.366	250	0.16230	260	0.166
70	0.282	260	8.719	260	0.18940		
72	0.284	270	10.270	270	0.22010		
74	0.286	280	12.050	280	0.25470		
76	0.287	290	14.070	290	0.29350		
78	0.289						
80	0.291						
82	0.293						
84	0.294						

# TETRAETHYL DITHIOPYROPHOSPHATE

TED

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dithiopyrophosphoric acid, O,O,O,O-tetraethyl ester Sulfotep Tetraethyl dithionopyrophosphate	Liquid  Colorless  Sinks in water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID.</b> Evacuate. Wear goggles and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** (C<sub>2</sub>H<sub>5</sub>O)<sub>2</sub>PSOPS(OC<sub>2</sub>H<sub>5</sub>)<sub>2</sub>  
2.3 **IMO/UN Designation:** 6.1/1704  
2.4 **DOT ID No.:** 1704  
2.5 **CAS Registry No.:** 3689-24-5  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Mask with canister approved for organic phosphate pesticides; goggles or face shield; rubber gloves and other protective clothing to prevent contact with skin.
- 3.2 **Symptoms Following Exposure:** Contact with liquid causes irritation of eyes and skin. Compound can be absorbed through skin. Ingestion of liquid or inhalation of mist causes nausea, vomiting, mental confusion, abdominal pain, sweating, giddiness, apprehension, and restlessness; later, muscular twitching of the eyelids and tongue begin, then other muscles of face and neck become involved; generalized twitching and muscle weakness may occur; pulmonary edema, ataxia, tremor, and convulsions may advance to coma.
- 3.3 **Treatment of Exposure:** Call physician for all exposures to this compound. **INHALATION:** support respiration; keep airway clear; use artificial respiration if breathing is difficult or has stopped. **EYES:** flush with water immediately after contact for at least 15 min. **SKIN:** remove victim's clothing and shoes immediately using rubber gloves; quickly wipe off affected area with clean cloths; immediately follow with a shower using plenty of soap; if complete shower is impossible, wash affected skin, hair, and fingernails repeatedly with soap and water using clean cloths each time to prevent spreading the contamination. **INGESTION:** induce vomiting repeatedly until vomit fluid is clear (save fluid for physician's examination); if vomiting cannot be induced within 5 min., have victim drink plenty of milk or water; have him lie down and keep him warm; if increased secretions make breathing difficult, prop patient up; if he stops breathing, apply artificial or mouth-to-mouth respiration, preferably through an airway; wash victim's mouth of contamination; mechanical resuscitator should be used if available; oxygen may be necessary; keep patient under observation for 24 hrs.
- 3.4 **TLV-TWA:** 0.2 mg/m<sup>3</sup> (skin)  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; oral LD<sub>50</sub> = 5 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Causes chromosomal damage in mice  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 10 mg/m<sup>3</sup> (skin)  
3.14 **OSHA PEL-TWA:** 0.2 mg/m<sup>3</sup> (skin)  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic phosphorus and sulfur oxides are produced.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly to form non-hazardous products
- 5.2 **Reactivity with Common Materials:**  
Corrosive to most metals in the presence of moisture
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Cautics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; Emulsifiable concentrate; Dry mixtures with inert solid, >2%.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** P109
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 322.3
- 9.3 **Boiling Point at 1 atm:** Not pertinent (very high)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.19 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TETRAETHYL DITHIOPYROPHOSPHATE

TED

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	74.839		N O T		N O T		N O T
54	74.770						
56	74.700						
58	74.629						
60	74.559		P		P		P
62	74.490		E		E		E
64	74.419		R		R		R
66	74.349		T		T		T
68	74.280		I		I		I
70	74.209		N		N		N
72	74.139		E		E		E
74	74.070		N		N		N
76	74.000		T		T		T
78	73.940						
80	73.870						
82	73.799						
84	73.730						
86	73.660						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.002		N O T		N O T		N O T
			P		P		P
			E		E		E
			R		R		R
			T		T		T
			I		I		I
			N		N		N
			E		E		E
			N		N		N
			T		T		T



# TRIETHYLENE GLYCOL

TEG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Di-beta-hydroxyethoxyethane 2,2'-Ethylenedioxydiethanol Ethylene glycol dihydroxydiethyl ether TEG Triglycol	Liquid  Colorless  Mild odor  Sinks and mixes with water.
Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	Not harmful.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ether  
2.2 Formula:  $\text{HO}(\text{CH}_2\text{CH}_2\text{O})_2\text{CH}_3$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 112-27-6  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51229

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles; plastic gloves.  
3.2 Symptoms Following Exposure: Vapor and liquid are unlikely to cause harm.  
3.3 Treatment of Exposure: Flush eyes and skin with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 1;  $\text{LD}_{50}$  = 5 to 15 g/kg (guinea pig)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to the eyes and throat.  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 330°F O.C. 350°F C.C.  
4.2 Flammable Limits in Air: 0.9%-9.2%  
4.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 700°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: 1.7 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 88.1 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 14.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 50%, 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: High purity; air treatment; commercial  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 150.17  
9.3 Boiling Point at 1 atm: 550°F = 288°C = 561°K  
9.4 Freezing Point: 24.3°F = -4.3°C = 268.9°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.125 at 20°C (liquid)  
9.8 Liquid Surface Tension: 45.2 dynes/cm = 0.0452 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.039  
9.12 Latent Heat of Vaporization: 180 Btu/lb = 99 cal/g =  $4.1 \times 10^5$  J/kg  
9.13 Heat of Combustion: -10,190 Btu/lb = -5,660 cal/g =  $-237.0 \times 10^3$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: (est.) -13 Btu/lb = -7 cal/g =  $-3 \times 10^5$  J/kg  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Very low

### NOTES

# TRIETHYLENE GLYCOL

TEG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	71.089	40	0.513		N		N
40	70.969	50	0.518		O		O
45	70.849	60	0.522		T		T
50	70.719	70	0.527				
55	70.599	80	0.531		P		P
60	70.480	90	0.536		E		E
65	70.360	100	0.540		R		R
70	70.240	110	0.545		T		T
75	70.120	120	0.549		I		I
80	70.000	130	0.553		N		N
85	69.870	140	0.558		E		E
90	69.750	150	0.562		N		N
95	69.629	160	0.567		T		T
100	69.509	170	0.571				
105	69.389	180	0.576				
110	69.270	190	0.580				
115	69.150	200	0.585				
120	69.030	210	0.589				
		220	0.593				
		230	0.598				
		240	0.602				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	310	0.141	310	0.00256	0	0.330
	I	320	0.186	320	0.00333	25	0.339
	S	330	0.242	330	0.00429	50	0.348
	C	340	0.312	340	0.00546	75	0.357
	I	350	0.400	350	0.00691	100	0.365
	B	360	0.507	360	0.00866	125	0.374
	L	370	0.639	370	0.01077	150	0.382
	E	380	0.798	380	0.01329	175	0.391
		390	0.990	390	0.01630	200	0.399
		400	1.219	400	0.01984	225	0.407
		410	1.492	410	0.02400	250	0.415
		420	1.814	420	0.02885	275	0.423
		430	2.193	430	0.03449	300	0.431
		440	2.637	440	0.04100	325	0.438
		450	3.152	450	0.04847	350	0.446
		460	3.749	460	0.05702	375	0.453
		470	4.436	470	0.06675	400	0.460
		480	5.224	480	0.07778	425	0.467
		490	6.125	490	0.09022	450	0.474
		500	7.149	500	0.10420	475	0.481
		510	8.310	510	0.11990	500	0.488
		520	9.620	520	0.13740	525	0.495
		530	11.090	530	0.15680	550	0.501
		540	12.740	540	0.17830	575	0.508
		550	14.590	550	0.20210	600	0.514
		560	16.640	560	0.22840		

# TETRAETHYL LEAD

TEL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lead tetraethyl TEL	Oily liquid  Colorless, but generally dyed red  Fruity odor  Sinks in water. Poisonous, flammable vapor is produced.
Evacuate. Keep people away. <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from behind barrier or protected location. Flood discharge area with water. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $Pb(C_2H_5)_4$
- 2.3 IMO/UN Designation: 6.1/1649
- 2.4 DOT ID No.: 1649
- 2.5 CAS Registry No.: 78-00-2
- 2.6 NAERG Guide No.: 131
- 2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor type canister face mask for short periods; air line type for longer periods; neoprene-coated, liquid-proof gloves; protective goggles or face shield; white or light-colored clothing; rubber shoes or boots.
- 3.2 **Symptoms Following Exposure:** Increased urinary output of lead. If a large degree of absorption from inhalation or skin contact, may cause insomnia, excitability, delirium, coma and death. Do not confuse with inorganic lead.
- 3.3 **Treatment of Exposure:** Remove victim from contaminated area and consult physician immediately.  
INGESTION: induce vomiting. SKIN: wash immediately with kerosene or similar petroleum distillate followed by soap and water.
- 3.4 **TLV-TWA:** 0.1 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Oral rat LD<sub>50</sub> = 17 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Lead poisoning
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 40 mg Pb/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 0.075 mg/m<sup>3</sup>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 185°F O.C. 200°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic gases are generated in fires.
- 4.6 **Behavior in Fire:** May explode in fires.
- 4.7 **Auto Ignition Temperature:** Decomposes above 230°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 66.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 19.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Rust and some metals cause decomposition.
- 5.3 **Stability During Transport:** Stable below 230°F. At higher temperatures, may detonate or explode when confined.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 0.20 mg/l/96 hr/bluegill/TL<sub>50</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: Yes
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	3
- 8.6 EPA Reportable Quantity: 10 pounds
- 8.7 EPA Pollution Category: A
- 8.8 RCRA Waste Number: P110
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 323.44
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** -215°F = -137°C = 136°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.633 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 28.5 dynes/cm = 0.0285 N/m at (est.) 25°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 40 dynes/cm = 0.04 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** (est.) -7,870 Btu/lb = -4,380 cal/g = -183 X 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TETRAETHYL LEAD

TEL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
46	103.400	50	0.597		N	28	1.247
48	103.200	52	0.597		O	30	1.222
50	103.099	54	0.597		T	32	1.199
52	102.900	56	0.597			34	1.175
54	102.799	58	0.597		P	36	1.153
56	102.599	60	0.597		E	38	1.131
58	102.500	62	0.597		R	40	1.109
60	102.299	64	0.597		T	42	1.088
62	102.200	66	0.597		I	44	1.068
64	102.000	68	0.597		N	46	1.048
66	101.900	70	0.597		E	48	1.029
68	101.700	72	0.597		N	50	1.010
70	101.599	74	0.597		T	52	0.992
72	101.400	76	0.597			54	0.974
74	101.299	78	0.597			56	0.957
76	101.099	80	0.597			58	0.940
78	101.000	82	0.597			60	0.924
80	100.799	84	0.597			62	0.908
82	100.700	86	0.597			64	0.892
84	100.500	88	0.597			66	0.877
86	100.400	90	0.597			68	0.862
88	100.200	92	0.597			70	0.847
90	100.099	94	0.597			72	0.833
92	99.929	96	0.597			74	0.819
94	99.780	98	0.597			76	0.806
96	99.629	100	0.597			78	0.793

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	35	0.001	35	0.00000		N
	N	40	0.001	40	0.00001		O
	S	45	0.002	45	0.00001		T
	O	50	0.002	50	0.00001		
	L	55	0.003	55	0.00001		P
	U	60	0.003	60	0.00001		E
	B	65	0.004	65	0.00002		R
	I	70	0.005	70	0.00002		T
	E	75	0.007	75	0.00003		I
		80	0.008	80	0.00003		N
		85	0.010	85	0.00004		E
		90	0.012	90	0.00005		N
		95	0.015	95	0.00006		T
		100	0.018	100	0.00007		
		105	0.022	105	0.00009		
		110	0.027	110	0.00010		
		115	0.032	115	0.00012		
		120	0.039	120	0.00015		
		125	0.047	125	0.00017		
		130	0.056	130	0.00021		
		135	0.066	135	0.00024		
		140	0.079	140	0.00029		
		145	0.093	145	0.00034		
		150	0.110	150	0.00039		
		155	0.129	155	0.00046		

# TRIETHYLAMINE

TEN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> TEN	Watery liquid      Colorless      Fishy odor  Floats on water. Flammable, irritating vapor is produced.
Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause coughing, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	<b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 7; Aliphatic amine  
 2.2 Formula: (C<sub>2</sub>H<sub>5</sub>)<sub>3</sub>N  
 2.3 IMO/UN Designation: 3.2/1296  
 2.4 DOT ID No.: 1296  
 2.5 CAS Registry No.: 121-44-8  
 2.6 NAERG Guide No.: 132  
 2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Air-supplied mask; goggles or face shield; rubber gloves.  
 3.2 **Symptoms Following Exposure:** Vapors irritate nose, throat, and lungs, causing coughing, choking, and difficult breathing. Contact with eyes causes severe burns. Clothing wet with chemical causes skin burns.  
 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give artificial respiration if needed; call a doctor. INGESTION: induce vomiting if patient is conscious. EYES: flush with water for at least 30 min.; call a doctor. SKIN: flush with water for at least 30 min.  
 3.4 **TLV-TWA:** 1 ppm (skin)  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** 3 ppm (skin)  
 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg (rat-LD<sub>50</sub> = 460 mg/kg)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation, such that personnel will find high concentrations unpleasant. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** 200 ppm  
 3.14 **OSHA PEL-TWA:** 25 ppm  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 10°F O.C.  
 4.2 **Flammable Limits in Air:** 1.2%-8.0%  
 4.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; alcohol foam for large fires.  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
 4.5 **Special Hazards of Combustion Products:** Not pertinent  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** 842°F  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** 6.2 mm/min.  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 51.2 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 14.5 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water.  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 80 ppm/24 hr/fish/lethal/fresh water  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 2  
 Human Oral hazard: 3  
 Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98.5+%  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** C  
 7.6 **Ship Type:** 2  
 7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
 8.2 **49 CFR Class:** 3  
 8.3 **49 CFR Package Group:** II  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

 8.6 **EPA Reportable Quantity:** 5000 pounds  
 8.7 **EPA Pollution Category:** D  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 101.19  
 9.3 **Boiling Point at 1 atm:** 193.1°F = 89.5°C = 362.7°K  
 9.4 **Freezing Point:** -174.5°F = -114.7°C = 158.5°K  
 9.5 **Critical Temperature:** 503.6°F = 262°C = 535.2°K  
 9.6 **Critical Pressure:** 440 psia = 30 atm = 3.0 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.729 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** 20.7 dynes/cm = 0.0207 N/m at 20°C  
 9.9 **Liquid Water Interfacial Tension:** Not pertinent  
 9.10 **Vapor (Gas) Specific Gravity:** 3.5  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.055  
 9.12 **Latent Heat of Vaporization:** 140 Btu/lb = 80 cal/g = 3.3 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -17,040 Btu/lb = -9,466 cal/g = -396.3 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** -180 Btu/lb = -99 cal/g = -4.1 X 10<sup>5</sup> J/kg  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** 2.3 psia

### NOTES

# TRIETHYLAMINE

TEN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	46.990	0	0.527		N		N
40	46.770	10	0.531		O		O
45	46.540	20	0.535		T		T
50	46.320	30	0.539				
55	46.090	40	0.543		P		P
60	45.870	50	0.547		E		E
65	45.640	60	0.552		R		R
70	45.420	70	0.556		T		T
75	45.190	80	0.560		I		I
80	44.970	90	0.564		N		N
85	44.740	100	0.568		E		E
90	44.510	110	0.572		N		N
95	44.290	120	0.577		T		T
100	44.060	130	0.581				
		140	0.585				
		150	0.589				
		160	0.593				
		170	0.597				
		180	0.602				
		190	0.606				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	5.500	20	0.235	20	0.00461	0	0.336
		30	0.329	30	0.00633	25	0.350
		40	0.453	40	0.00855	50	0.365
		50	0.614	50	0.01137	75	0.379
		60	0.822	60	0.01491	100	0.393
		70	1.084	70	0.01930	125	0.407
		80	1.413	80	0.02469	150	0.421
		90	1.821	90	0.03123	175	0.435
		100	2.321	100	0.03909	200	0.449
		110	2.928	110	0.04845	225	0.462
		120	3.659	120	0.05950	250	0.476
		130	4.531	130	0.07244	275	0.489
		140	5.565	140	0.08748	300	0.502
		150	6.780	150	0.10480	325	0.515
		160	8.199	160	0.12470	350	0.528
		170	9.845	170	0.14740	375	0.541
		180	11.740	180	0.17310	400	0.554
		190	13.920	190	0.20200	425	0.566
		200	16.400	200	0.23430	450	0.579
		210	19.210	210	0.27040	475	0.591
		220	22.380	220	0.31050	500	0.604
		230	25.950	230	0.35470	525	0.616
		240	29.940	240	0.40330	550	0.628
		250	34.380	250	0.45660	575	0.639
		260	39.300	260	0.51480	600	0.651

# TETRAETHYL PYROPHOSPHATE

TEP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bladan Ethylpyrophosphate Killax Mortopal Nitos T.E.P. T.E.P.P. Tetron Vapotone	Liquid  Colorless to yellow  Faint fruity odor  Mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Dilute and disperse	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $(C_2H_5O)_2P(O)PO_2(OC_2H_5)_2$ or $(C_2H_5)_4P_2O_7$ 2.3 IMO/UN Designation: 6.1/1705 2.4 DOT ID No.: 3018 2.5 CAS Registry No.: 107-49-3 2.6 NAERG Guide No.: 152 2.7 Standard Industrial Trade Classification: 51631
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Mask with canister approved for organic phosphate pesticides; goggles or face shield; rubber gloves and other protective clothing to prevent contact with skin. 3.2 <b>Symptoms Following Exposure:</b> Contact with liquid causes irritation of eyes and skin. Compound can be absorbed through skin. Ingestion of liquid or inhalation of mist causes nausea, vomiting, mental confusion, abdominal pain, sweating, giddiness, apprehension, and restlessness; later, muscular twitching of eyelids and tongue begin, then other muscles of face and neck become involved; pulmonary edema, ataxia, tremor, and convulsions may advance to coma. 3.3 <b>Treatment of Exposure:</b> Call physician for all exposures to this compound. INHALATION: support respiration; keep airway clear; use artificial respiration if breathing is difficult or has stopped. EYES: flush with water immediately after contact for at least 15 min. SKIN: remove victim's clothing and shoes immediately using rubber gloves; quickly wipe off affected area with clean cloths; immediately follow with a shower using plenty of soap; if complete shower is impossible, wash affected skin, hair, and fingernails repeatedly with soap and water using clean cloths each time to prevent spreading the contamination. INGESTION: induce vomiting by putting a finger down the throat or by giving warm salt water (one tablespoon salt per glass). Repeat until vomit fluid is clear (save fluid for physician's examination); if vomiting cannot be induced within five minutes, have victim drink plenty of milk or water; have him lie down and keep him warm; if there is difficulty in breathing due to increased secretions, chest may be cleared by propping patient up; if he stops breathing, use artificial or mouth-to-mouth respiration, preferably through an airway; wash victim's mouth of contamination; mechanical resuscitator should be used if available; oxygen may be necessary; keep patient under observation for 24 hrs.  3.4 TLV-TWA: 0.004 ppm (skin) 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 4; LD <sub>50</sub> <50 mg/kg 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: Currently not available 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: 5 mg/m <sup>3</sup> (skin) 3.14 OSHA PEL-TWA: 0.05 mg/m <sup>3</sup> (skin) 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
**Products:** Highly toxic gases and vapors of unburned material and phosphoric acid are formed in fires.
- 4.6 **Behavior in Fire:** Water streams applied to adjacent fires will spread contamination of pesticide over wide area.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly to form phosphoric acid
- 5.2 **Reactivity with Common Materials:**  
Corrosive to aluminum, slowly corrosive to copper, brass, zinc, and tin
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.0 ppm/96 hr/fathead/TL<sub>50</sub>/fresh water  
500 ppm\*/marine plankton/no growth or lethal/salt water  
\*Time period not specified.
- 6.2 **Waterfowl Toxicity:** LD<sub>50</sub> = 3.56 mg/kg
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 4  
Human Contact hazard: II  
Reduction of amenities: XXX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 40% plus 60% related ethyl phosphates; Aerosols (5-10%) (Class A poisons); Dusts (0.66-1.2%); Sprays 10-40%.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** P111
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 290.2
- 9.3 **Boiling Point at 1 atm:** Not pertinent
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.18 at 25°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# TETRAETHYL PYROPHOSPHATE

TEP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	74.209		N O T		N O T		N O T
54	74.139						
56	74.070						
58	74.000						
60	73.940		P		P		P
62	73.870		E		E		E
64	73.799		R		R		R
66	73.730		T		T		T
68	73.660		I		I		I
70	73.589		N		N		N
72	73.520		E		E		E
74	73.450		N		N		N
76	73.379		E		E		E
78	73.309		N		N		N
80	73.240						
82	73.169						
84	73.099						
86	73.030						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T		N O T		N O T
			P		P		P
			E		E		E
			R		R		R
			T		T		T
			I		I		I
			N		N		N
			E		E		E
			N		N		N



# 2,4,5-T ESTERS

TES

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Butoxypropyl trichlorophenoxyacetate Butyl 2,4,5- trichlorophenoxyacetate Isocetyl trichlorophenoxyacetate	Liquid  Yellowish brown  Mild odor  Sinks in water.
Keep people away. Avoid contact with liquid. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Irritating gases may be produced when heated. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals or carbon dioxide. Water and foam may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** 2, 4, 5-Cl<sub>3</sub>C<sub>6</sub>H<sub>2</sub>OCH<sub>2</sub>COOR where  
R=C<sub>4</sub>H<sub>9</sub>, C<sub>8</sub>H<sub>17</sub>, etc.  
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 93-79-8  
2.6 **NAERG Guide No.:** Not listed.  
2.7 **Standard Industrial Trade Classification:**  
51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield and rubber gloves  
3.2 **Symptoms Following Exposure:** Ingestion causes intestinal disturbances. Contact with eyes or skin causes mild irritation; transient corneal injury may occur.  
3.3 **Treatment of Exposure:** INGESTION: promptly induce vomiting and get medical attention. EYES: flush with flowing water and get medical attention. SKIN: wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50-500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
265–420°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion**  
**Products:** Hydrogen chloride gas and other irritating fumes may form in fires.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** May attack some forms of plastics  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Isocetyl ester: 26 ppm/48  
hr/bluegill/TL<sub>w</sub>/fresh water  
Butoxypropyl ester: 17 ppm/48  
hr/bluegill/TL<sub>w</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 96-99%; 55-65% solutions in kerosene or diesel oil, which are combustible.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Mixtures, all greater than 300  
9.3 **Boiling Point at 1 atm:** Butyl: 639°F = 337°C = 610°K  
Butoxypropyl: 651°F = 344°C = 617°K  
Isocetyl: 770°F = 410°C = 683°K  
2-Ethylhexyl: ~770°F = ~410°C = ~683°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.2 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 2,4,5-T ESTERS

TES

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	76.089		N		N		N
36	76.020		O		O		O
38	75.950		T		T		T
40	75.879						
42	75.809		P		P		P
44	75.740		E		E		E
46	75.669		R		R		R
48	75.599		T		T		T
50	75.530		I		I		I
52	75.459		N		N		N
54	75.389		E		E		E
56	75.320		N		N		N
58	75.250		T		T		T
60	75.179						
62	75.110						
64	75.049						
66	74.980						
68	74.910						
70	74.839						
72	74.770						
74	74.700						
76	74.629						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C	430	0.859	430	0.03599		N
	U	440	1.007	440	0.04170		O
	R	450	1.176	450	0.04816		T
	R	460	1.368	460	0.05544		
	E	470	1.587	470	0.06362		P
	N	480	1.836	480	0.07279		E
	T	490	2.116	490	0.08303		R
	L	500	2.432	500	0.09444		T
	Y	510	2.787	510	0.10710		I
		520	3.186	520	0.12120		N
	N	530	3.631	530	0.13670		E
	O	540	4.128	540	0.15390		R
	T	550	4.681	550	0.17280		T
		560	5.295	560	0.19350		I
	A	570	5.976	570	0.21630		N
	V	580	6.728	580	0.24110		E
	A	590	7.557	590	0.26830		R
	I	600	8.471	600	0.29790		T
	L	610	9.474	610	0.33000		I
	A	620	10.570	620	0.36490		N
	B	630	11.780	630	0.40280		E
	L	640	13.090	640	0.44370		
	E	650	14.530	650	0.48790		
		660	16.090	660	0.53550		

# TRIETHYLENETETRAMINE

TET

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> N,N'-bis-(2-Aminoethyl)ethylenediamine TETA Trien	Oily liquid  Light straw to amber  Ammonia odor  Floats and mixes with water.
<b>Keep people away. Avoid contact with liquid. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 7; Aliphatic amine  
2.2 **Formula:**  $\text{NH}(\text{CH}_2)_2\text{NH}(\text{CH}_2)_2\text{NH}(\text{CH}_2)_2\text{NH}_2$   
2.3 **IMO/UN Designation:** Not listed  
2.4 **DOT ID No.:** 2259  
2.5 **CAS Registry No.:** 112-24-3  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51452

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Amine-type canister; goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Vapors from hot liquid can irritate eyes and upper respiratory system. Liquid burns eyes and skin. May cause sensitization of skin.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. INGESTION: do NOT induce vomiting; give large quantities of water; give at least one ounce of vinegar in equal amount of water; get medical attention. SKIN: flush with plenty of water. EYES: flush with plenty of water for at least 15 min. and get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May cause dermatitis, asthma and other allergic reactions in man  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 290°F O.C. 275°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 640°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 69.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 19.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** After dilution with water, can be neutralized with acetic acid.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 146.24  
9.3 **Boiling Point at 1 atm:** 531.3°F = 277.4°C = 550.6°K  
9.4 **Freezing Point:** -31°F = -35°C = 238°K  
9.5 **Critical Temperature:** 860.0°F = 460°C = 733.2°K  
9.6 **Critical Pressure:** 470 psia = 32 atm = 3.2 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.982 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.037  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -13,500 Btu/lb = -7,530 cal/g = -315 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (est.) -13 Btu/lb = -7 cal/g = -0.3 X 10<sup>3</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

### NOTES

# TRIETHYLENETETRAMINE

TET

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	62.280	85	0.607		N		N
40	62.140	90	0.612		O		O
45	62.000	95	0.617		T		T
50	61.860	100	0.622				
55	61.720	105	0.627		P		P
60	61.580	110	0.633		E		E
65	61.440	115	0.638		R		R
70	61.310	120	0.643		T		T
75	61.170	125	0.648		I		I
80	61.030	130	0.653		N		N
85	60.890	135	0.658		E		E
90	60.750	140	0.663		N		N
95	60.610	145	0.669		T		T
100	60.470	150	0.674				
105	60.340						
110	60.200						
115	60.060						
120	59.920						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	300	0.241	300	0.00431	0	0.344
	I	320	0.391	320	0.00683	25	0.357
	S	340	0.614	340	0.01046	50	0.370
	C	360	0.938	360	0.01559	75	0.383
	I	380	1.395	380	0.02263	100	0.396
	B	400	2.025	400	0.03209	125	0.409
	L	420	2.876	420	0.04454	150	0.421
	E	440	4.003	440	0.06062	175	0.433
		460	5.471	460	0.08105	200	0.445
		480	7.352	480	0.10660	225	0.457
		500	9.727	500	0.13810	250	0.468
		520	12.690	520	0.17640	275	0.480
		540	16.330	540	0.22250	300	0.491
		560	20.750	560	0.27730	325	0.502
		580	26.080	580	0.34180	350	0.512
		600	32.430	600	0.41690	375	0.523
						400	0.533
						425	0.543
						450	0.553
						475	0.563
						500	0.572
						525	0.581
						550	0.590
						575	0.599
						600	0.608

# TALLOW FATTY ALCOHOL

TFA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Higher fatty alcohol Stearyl alcohol, crude	Waxy solid White Mild soapy odor  Floats on water.
Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	SOLID Not harmful.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $C_{18}H_{37}OH$  (approx.)  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51217

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Material is practically non-toxic. Contact with eyes or prolonged contact with skin can cause mild irritation.  
3.3 **Treatment of Exposure:** EYES: flush with water; if irritation persists, see a doctor. SKIN: wipe off, wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral  $LD_{50}$  = 1,900 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
>270°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 128.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 37.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (0)  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 262 (avg.)  
9.3 **Boiling Point at 1 atm:** >480°F = >249°C = >522°K  
9.4 **Freezing Point:** 127°F = 53°C = 326°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.810 at 25°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) -18,500 Btu/lb = -10,300 cal/g = -430 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TALLOW FATTY ALCOHOL

TFA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# TRIFLUOROCHLOROETHYLENE

TFC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlorotrifluoroethylene CTFE Genetron 1113 Kel F monomer Trifluoromono-chloroethylene Trifluorovinyl chloride	Gas  Colorless  Odorless or faint odor  Sinks and boils in water. Flammable visible vapor cloud. is produced.
<b>Evacuate.</b> Keep people away. Avoid contact with liquid. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Let fire burn. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water.
<b>Exposure</b>	Call for medical aid.  VAPOR If inhaled will cause dizziness, nausea, or vomiting. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Not harmful to aquatic life.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: F <sub>2</sub> C=CFCl 2.3 IMO/UN Designation: 2/1082 2.4 DOT ID No.: 1082 2.5 CAS Registry No.: 79-38-9 2.6 NAERG Guide No.: 119P 2.7 Standard Industrial Trade Classification: 51137
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus; goggles; rubber gloves. 3.2 <b>Symptoms Following Exposure:</b> Inhalation causes dizziness, nausea, vomiting; liver and kidney injury may develop after several hours and cause jaundice and necrosis of the kidney. Contact with liquid causes frostbite of eyes and possibly of skin. 3.3 <b>Treatment of Exposure:</b> Call a physician after all exposures to this compound; it is more toxic than most of the closely related propellant gases. INHALATION: remove victim to fresh air; enforce bed rest; administer oxygen for 30 min. of every hour for 6 hours, even if no symptoms appear. SKIN: if frostbite has occurred, apply warm water and treat burn. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Not pertinent (TFC is a gas at normal temperatures) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent (gas)  
4.2 **Flammable Limits in Air:** 16%-34%  
4.3 **Fire Extinguishing Agents:** Let fire burn; stop gas flow; cool containers with water.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and hydrogen fluoride gases are formed.  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode in a fire.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Can occur  
5.6 **Inhibitor of Polymerization:** Terpenes; Tributylamine (1%)

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** None  
6.2 **Waterfowl Toxicity:** None  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Polymerization grade, 99.0+%  
7.2 **Storage Temperature:** Ambient, but less than 150°F  
7.3 **Inert Atmosphere:** Air must be excluded.  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison gas  
8.2 **49 CFR Class:** 2.3  
8.3 **49 CFR Package Group:** Not pertinent.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	-
Flammability (Red).....	4
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
9.2 **Molecular Weight:** 116.5  
9.3 **Boiling Point at 1 atm:** -18°F = -28°C = 245°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** (est.) 223.2°F = 106.2°C = 379.4°K  
9.6 **Critical Pressure:** (est.) 592 psia = 40.2 atm = 4.08 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 1.307 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 12 dynes/cm = 0.012 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 4.02  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 83 Btu/lb = 46 cal/g = 1.92 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# TRIFLUOROCHLOROETHYLENE

TFC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	-20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12 14	14.240 14.820 15.410 16.030 16.660 17.310 17.990 18.670 19.380 20.110 20.870 21.640 22.440 23.250 24.090 24.960 25.840 26.750	-20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12 14	0.35140 0.36400 0.37700 0.39020 0.40380 0.41780 0.43210 0.44670 0.46170 0.47700 0.49270 0.50870 0.52520 0.54190 0.55910 0.57670 0.59460 0.61290		N O T  P E R T I N E N T



# TETRAFLUOROETHYLENE

TFE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Teflon monomer	Compressed Gas      Colorless      Odorless or faint odor  Visible vapor cloud is produced.
Keep people away. Shut off ignition sources, call fire department. Stay upwind. Use water spray to "knock down" vapor. Evacuate area in case of large discharge. Notify local health and pollution control agencies. Avoid contact with vapor.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Let fire burn. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $F_2C=CF_2$   
2.3 IMO/UN Designation: 2/1081  
2.4 DOT ID No.: 1081  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 116P  
2.7 Standard Industrial Trade Classification: 51137

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Self-contained breathing apparatus for high gas concentrations  
3.2 Symptoms Following Exposure: Inhalation causes irritation of respiratory system. Contact with eyes causes slight irritation.  
3.3 Treatment of Exposure: INHALATION: remove victim from exposure; if breathing is difficult, give artificial respiration and call physician.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Causes possible impairment of immunological defense system in rats  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent  
4.2 Flammable Limits in Air: 10%-50%  
4.3 Fire Extinguishing Agents: Let fire burn; stop flow of gas; cool containers with water.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: When burned in air, gas forms toxic carbonyl fluoride and hydrogen fluoride.  
4.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode.  
4.7 Auto Ignition Temperature: 370°F  
4.8 Electrical Hazards:  $C_2F_4$ -air mixtures produced explosions which propagated through the smallest clearance in the standard test conducted by Underwriters Laboratories. It does not meet any group classification.  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Can polymerize in the absence of inhibitor, especially when heated or in presence of oxygen.  
5.6 Inhibitor of Polymerization: d-limonene; pinene; tetrahydronaphthalene; 1-octene; methyl methacrylate

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: None  
6.2 Waterfowl Toxicity: None  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 98+%  
7.2 Storage Temperature: Cool ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Safety relief  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable gas  
8.2 49 CFR Class: 2.1  
8.3 49 CFR Package Group: Not pertinent.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2 3
Flammability (Red).....	4 4
Instability (Yellow).....	3 3

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Gas  
9.2 Molecular Weight: 100.0  
9.3 Boiling Point at 1 atm:  $-105^{\circ}F = -76^{\circ}C = 197^{\circ}K$   
9.4 Freezing Point:  $-224^{\circ}F = -142^{\circ}C = 131^{\circ}K$   
9.5 Critical Temperature: (est.)  $92^{\circ}F = 33^{\circ}C = 306^{\circ}K$   
9.6 Critical Pressure: (est.) 573 psia = 38.9 atm = 3.95 MN/m<sup>2</sup>  
9.7 Specific Gravity: Not pertinent  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 3.45  
9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.1261  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.)  $-4,000 \text{ Btu/lb} = -2,000 \text{ cal/g} = -90 \times 10^6 \text{ J/kg}$   
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization:  $-450 \text{ Btu/lb} = -250 \text{ cal/g} = -10.5 \times 10^6 \text{ J/kg}$   
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# TETRAFLUOROETHYLENE

TFE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	-100 -95 -90 -85 -80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25	17.290 19.860 22.720 25.910 29.440 33.340 37.630 42.350 47.510 53.160 59.310 66.009 73.270 81.120 89.610 98.759 108.599 119.200 130.500 142.599 155.599 169.400 184.099 199.699 216.299 233.799	-100 -95 -90 -85 -80 -75 -70 -65 -60 -55 -50 -45 -40 -35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25	0.44790 0.50730 0.57270 0.64420 0.72230 0.80730 0.89960 0.99950 1.10700 1.22400 1.34900 1.48300 1.62600 1.78000 1.94300 2.11700 2.30100 2.49700 2.70400 2.92200 3.15300 3.39600 3.65100 3.91900 4.20000 4.49400	0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440	0.166 0.169 0.173 0.176 0.179 0.183 0.186 0.189 0.192 0.195 0.198 0.201 0.204 0.207 0.209 0.212 0.215 0.217 0.220 0.222 0.225 0.227 0.229

# TRIFLURALIN

TFR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2,6-Dinitro-n,n-dipropyl-4-trifluoromethylaniline Treflan alpha,alpha,alpha-Trifluoro-2,6-Dinitro-n,n-dipropyl-p-toluidine		Solid  Yellow-orange  Sinks in water.
Call fire department. <b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear goggles and dust respirator. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide.	
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim; Dredge

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula:  $C_{15}H_{16}F_3N_2O_4$   
 2.3 IMO/UN Designation: 6.1/1609  
 2.4 DOT ID No.: Not listed.  
 2.5 CAS Registry No.: 1582-09-8  
 2.6 NAERG Guide No.: Not listed  
 2.7 Standard Industrial Trade Classification: 51454

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Protective gloves; goggles; dust mask  
 3.2 **Symptoms Following Exposure:** Dust may irritate eyes. No toxic symptoms have been observed during the manufacture and use of this compound.  
 3.3 **Treatment of Exposure:** INHALATION: move to fresh air. EYES: wash with running water; call physician if irritation persists. SKIN: wash with soap and running water. INGESTION: induce vomiting; call physician.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 3; oral  $LD_{50}$  = 500 mg/kg (rat)  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
 >185°F O.C.  
 4.2 **Flammable Limits in Air:** Not pertinent  
 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
 4.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen fluoride gas may be formed in fires.  
 4.6 **Behavior in Fire:** Not pertinent  
 4.7 **Auto Ignition Temperature:** Not pertinent  
 4.8 **Electrical Hazards:** Not pertinent  
 4.9 **Burning Rate:** Not pertinent  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 91.6 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 25.5 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
 1.1 X  $10^{-5}$  g/l/48 hr/rainbow trout/ $TL_{50}$ /fresh water  
 0.58 ppm/48 hr/bluegill/ $LC_{50}$ /fresh water  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** Currently not available  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical: 95%. Emulsifiable concentrate in flammable solvents.  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Pressure-vacuum  
 7.5 **IMO Pollution Category:** Currently not available  
 7.6 **Ship Type:** Currently not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** 10 pounds  
 8.7 **EPA Pollution Category:** A  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
 9.2 **Molecular Weight:** 335.3  
 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
 9.4 **Freezing Point:** 108°F = 42°C = 315°K  
 9.5 **Critical Temperature:** Not pertinent  
 9.6 **Critical Pressure:** Not pertinent  
 9.7 **Specific Gravity:** 1.294 at 25°C (solid)  
 9.8 **Liquid Surface Tension:** Not pertinent  
 9.9 **Liquid Water Interfacial Tension:** Not pertinent  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** Not pertinent  
 9.13 **Heat of Combustion:** (est.) -9,040 Btu/lb = -5,020 cal/g = -210 X  $10^6$  J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRIFLURALIN

TFR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
80	0.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# TRIPROPYLENE GLYCOL

TGC

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Liquid	Colorless	Characteristic odor
May float or sink and mix with water.			
Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
Fire	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
Exposure	LIQUID Not harmful.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ether  
2.2 Formula:  $\text{HO}(\text{C}_3\text{H}_6\text{O})_2\text{C}_3\text{H}_6\text{OH}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 24800-44-0  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51229

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Plastic gloves; safety glasses or face shield  
3.2 Symptoms Following Exposure: Non-irritating; no symptoms observed by any exposure route.  
3.3 Treatment of Exposure: INGESTION: if large amounts are swallowed, induce vomiting; treat symptomatically. EYES or SKIN: flush with water; get medical attention if ill effects develop.  
3.4 TLV-TWA: Currently not available  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; oral  $\text{LD}_{50} = 3,000 \text{ mg/kg}$  (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat.  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 285°F O.C.  
4.2 Flammable Limits in Air: 0.8%-5.0% (est.)  
4.3 Fire Extinguishing Agents: "Alcohol" foam, dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective  
4.5 Special Hazards of Combustion Products: Acid fumes of acids and aldehydes may form in fires.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 57.1 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 19.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: May attack some forms of plastics  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 99%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 192.26  
9.3 Boiling Point at 1 atm: 523°F = 273°C = 546°K  
9.4 Freezing Point: (sets to glass) -49°F = -45°C = 228°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.022 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: (est.) -13,700 Btu/lb = -7,610 cal/g = -318 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Low

### NOTES

# TRIPROPYLENE GLYCOL

TGC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	64.849		N O T		N O T		N O T
36	64.780						
38	64.709						
40	64.639						
42	64.570		P		P		P
44	64.500		E		E		E
46	64.429		R		R		R
48	64.360		T		T		T
50	64.290		I		I		I
52	64.230		N		N		N
54	64.160		E		E		E
56	64.089		N		N		N
58	64.020		T		T		T
60	63.950						
62	63.880						
64	63.810						
66	63.740						
68	63.670						
70	63.600						
72	63.530						
74	63.460						
76	63.390						
78	63.320						
80	63.250						
82	63.190						
84	63.120						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# TRIETHYLENE GLYCOL DI-(2-ETHYL BUTYRATE)

TGD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Triglycol dicaproate Triglycol dihexoate		Liquid	Light colored
<b>Wear full impervious protective clothing and approved respirator.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula:  $(C_8H_{16}COOCH_2CH_2OCH_2)_2$   
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 95-08-9  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.
- 3.3 **Treatment of Exposure:** Call for medical aid. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral rat  $LD_{50} = 6.0$  g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 385°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 111.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 35.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: -  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Open.
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 346.52
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.9946 @ 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRIETHYLENE GLYCOL DI-(2-ETHYLBUTYRATE)

TGD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	8.300		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# TRIETHYLENE GLYCOL ETHYL ETHER

TGE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Triethylene glycol monoethyl ether Triglycol monoethyl ether		Liquid	Colorless	Odorless
		Sinks and mixes with water.		
Call fire department. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water and foam may be ineffective on fire. Cool exposed containers with water.			
<b>Exposure</b>	Not harmful.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ethers
- 2.2 Formula:  $C_8H_{18}O(CH_2)_2O(CH_2)_2OCH_2CH_2OH$
- 2.3 IMO/UN Designation: Not listed.
- 2.4 DOT ID No.: Not listed.
- 2.5 CAS Registry No.: 112-50-5
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Chemical safety goggles and adequate protective clothing.
- 3.2 Symptoms Following Exposure: No appreciable hazard in ordinary handling or use.
- 3.3 Treatment of Exposure: Wash affected parts with water.
- 3.4 TLV-TWA: Not pertinent.
- 3.5 TLV-STEL: Not pertinent.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 1;  $LD_{50} = 10.61 \text{ g/kg (rat)}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat.
- 3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 275°F O.C.
- 4.2 Flammable Limits in Air: Not pertinent.
- 4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, or alcohol foam.
- 4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Not listed.
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 50.0 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 17.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.
- 5.2 Reactivity with Common Materials: No reaction.
- 5.3 Stability During Transport: Stable.
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
- 5.5 Polymerization: Will not polymerize.
- 5.6 Inhibitor of Polymerization: Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None.
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 0
  - Human Oral hazard: 0
  - Human Contact hazard: 0
  - Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available
- 7.2 Storage Temperature: Ambient.
- 7.3 Inert Atmosphere: No requirement.
- 7.4 Venting: Not listed.
- 7.5 IMO Pollution Category: D
- 7.6 Ship Type: Data not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.
- 8.2 49 CFR Class: Not pertinent.
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 178.26
- 9.3 Boiling Point at 1 atm: 493°F = 256°C = 529°K
- 9.4 Freezing Point: -1.7°F = -18.7°C = 254.5°K
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 1.020 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Currently not available
- 9.11 Ratio of Specific Heats of Vapor (Gas): 1.033
- 9.12 Latent Heat of Vaporization: (est.) 125 Btu/lb = 69 cal/g =  $2.9 \times 10^5 \text{ J/kg}$
- 9.13 Heat of Combustion: (est.) = -11,000 Btu/lb = -6,170 cal/g =  $-258 \times 10^5 \text{ J/kg}$
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent.
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Very low.

### NOTES

# TRIETHYLENE GLYCOL ETHYL ETHER

TGE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	8.510		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# TRIPROPYLENE GLYCOL METHYL ETHER

TGM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dowanol TPM Propanol, 3-(3-(3-methoxypropoxy)propoxy)-	Liquid	Colorless	Mild odor
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water. Wear self contained breathing apparatus.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID May be irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink 2 glasses of water and immediately induce vomiting.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ethers
- 2.2 Formula: CH<sub>3</sub>(CH<sub>2</sub>CH(CH<sub>3</sub>)O)<sub>3</sub>OH
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 25498-49-1
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical goggles, rubber boots and gloves, and self contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** May cause slight transient (temporary) eye irritation. Corneal injury is unlikely. Prolonged or repeated exposure is not likely to cause significant skin irritation. Repeated prolonged exposure may cause sleepiness. Single prolonged exposure is not likely to result in absorption of harmful amount through skin. Low oral toxicity. Ingestion of large amount may cause injury. Exposure may have anesthetic or narcotic effects.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove to fresh air. If not breathing, give mouth-to-mouth resuscitation. If breathing is difficult, give oxygen. INGESTION: If conscious, have victim drink 2 glasses of water and immediately induce vomiting. EYES: Irrigate with water for at least 15 minutes. SKIN: Wash off in flowing water or shower.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 3.3g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Prolonged and repeated exposure to high concentration may cause kidney and neural disfunction.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are non-irritating to eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 232°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water fog, alcohol foam, carbon dioxide, dry chemical.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 64.3 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 21.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** No reaction.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Will not occur.
- 5.6 **Inhibitor of Polymerization:** Not perinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** Data not avaiable
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 206.3
- 9.3 **Boiling Point at 1 atm:** 468°F = 242.4°C = 515.2°K
- 9.4 **Freezing Point:** -110°F = -78.89°C = 194.3°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.965
- 9.8 **Liquid Surface Tension:** 30 dynes/cm = 0.030 N/m
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 7.15
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRIPROPYLENE GLYCOL METHYL ETHER

TGM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	60.070		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	77	0.000		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.308 0.321 0.333 0.345 0.357 0.368 0.380 0.391 0.402 0.413 0.423 0.434 0.444 0.454 0.463 0.473 0.482 0.492 0.501 0.510 0.518 0.527 0.535 0.543 0.551

# TRIETHYLENE GLYCOL METHYL ETHER

TGY

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Triethylene glycol monomethyl ether Triglycol methyl ether		Liquid	Colorless	Odorless
Call fire department. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water and foam may be ineffective on fire. Cool exposed containers with water.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{CH}_3\text{O}(\text{CH}_2)_3\text{O}(\text{CH}_2)_3\text{OCH}_3$
- 2.3 IMO/UN Designation: Currently not available
- 2.4 DOT ID No.: Not listed.
- 2.5 CAS Registry No.: 112-35-6
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Chemical safety goggles and adequate protective clothing.
- 3.2 Symptoms Following Exposure: No appreciable hazard in ordinary handling or use.
- 3.3 Treatment of Exposure: Wash affected parts with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 1;  $\text{LD}_{50} = 11.3 \text{ g/kg (rat)}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat.
- 3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point:  $>230^\circ\text{F C.C.}$
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, or alcohol foam.
- 4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Not listed.
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 42.8 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 15.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.
- 5.2 Reactivity with Common Materials: No reaction.
- 5.3 Stability During Transport: Stable.
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
- 5.5 Polymerization: Will not polymerize.
- 5.6 Inhibitor of Polymerization: Not pertinent.

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None.
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 0
  - Human Oral hazard: 0
  - Human Contact hazard: 0
  - Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available
- 7.2 Storage Temperature: Ambient.
- 7.3 Inert Atmosphere: No requirement.
- 7.4 Venting: Not listed.
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.
- 8.2 49 CFR Class: Not pertinent.
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at  $15^\circ\text{C}$  and 1 atm: Liquid
- 9.2 Molecular Weight: 164.23
- 9.3 Boiling Point at 1 atm: Currently not available
- 9.4 Freezing Point: Currently not available
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 1.026
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Currently not available
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent.
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# TRIETHYLENE GLYCOL METHYL ETHER

TGY

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# TRIMETHYL HEXAMETHYLENE DIAMINE

THA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,6-Diamino-2,2,4-(or 2,4,4)-trimethylhexane 1,6-Hexanediamine, 2,2,4(or2,4,4)-trimethyl-	Liquid  Floats and mixes with water.	Colorless	Faint amine
<b>Keep people away. Avoid contact with liquid and vapor.</b> <b>Wear self-contained breathing apparatus (positive pressure if available) and full protective clothing.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>			
<b>Fire</b>	Combustible Fire may produce irritating or poisonous gases. Wear self-contained breathing apparatus (positive pressure if available) and full protective clothing. Extinguish small fires with dry chemicals, CO <sub>2</sub> , water spray or alcohol foam; large fires with water spray, fog or alcohol foam.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, mucous membranes and skin. Overexposure causes coughing and nausea. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn eyes and skin. May be harmful if swallowed. Remove and isolate contaminated clothing and shoes. Flush affected areas with running water for at least 15 minutes. IF IN EYES hold eyelids open while flushing with water. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 7; Aliphatic amine  
2.2 **Formula:** C<sub>6</sub>H<sub>12</sub>N<sub>2</sub>  
2.3 **IMO/UN Designation:** 8/2327  
2.4 **DOT ID No.:** 2327  
2.5 **CAS Registry No.:** 25513-64-8  
2.6 **NAERG Guide No.:** 153  
2.7 **Standard Industrial Trade Classification:** 51452

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained (positive pressure if available) breathing apparatus (with acid filter like that used for ammonia) and full protective clothing.
- 3.2 **Symptoms Following Exposure:** INHALATION: Irritating to mucous membranes. EYES and SKIN: Irritation. INGESTION: May be harmful if swallowed.
- 3.3 **Treatment of Exposure:** INHALATION: Remove victim to fresh air. Keep victim warm and quiet. If breathing has stopped, give artificial respiration. If breathing is difficult, administer oxygen. EYES or SKIN: Immediately flush with running water for at least 15 minutes. (Hold eyelids open if necessary.) Keep victim quiet and maintain normal body temperature. Remove and isolate contaminated clothing and shoes at site. INGESTION: If victim is unconscious or having convulsions, do nothing except maintain normal body temperature and seek medical aid.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Overexposure causes coughing and nausea.  
3.11 **Liquid or Solid Characteristics:** Contact causes burns to skin and eyes. Visible necrosis of intact skin occurs within a period of 1 to 4 hours.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 261°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Small fires: Dry chemical, CO<sub>2</sub>, water spray or alcohol foam. Large fires: Water spray, fog or alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** May contain toxic and irritating gases including NO<sub>x</sub>.  
4.6 **Behavior in Fire:** May generate toxic and irritating gases.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 78.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 22.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Not pertinent  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Sodium bisulfate  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** >99.7%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material  
8.2 **49 CFR Class:** 8  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Currently not available  
9.2 **Molecular Weight:** 158.29 (calculated)  
9.3 **Boiling Point at 1 atm:** 449.6°F = 232°C = 505.2°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.867 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 5.47  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRIMETHYL HEXAMETHYLENE DIAMINE

THA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	54.100		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E	75	0.001		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# THALLIUM CARBONATE

THB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carbonic acid, thallium (1+) salt Dithallium carbonate Thallous carbonate		Solid (Crystals)      White
		Sinks and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Nonflammable. Poisonous and irritating fumes are produced in a fire or when heated. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small adjacent fires: dry chemical, carbon dioxide, water spray, or foam; large fires: water spray, fog, or foam.	
<b>Exposure</b>	CALL FOR MEDICAL AID. POISONOUS. MAY BE FATAL IF INHALED, SWALLOWED OR ABSORBED THROUGH SKIN. ONSET OF SYMPTOMS MAY BE DELAYED 12 TO 24 HOURS. DUST Irritating to eyes and skin. If in eyes or on skin, flush with running water for at least 15 minutes; hold eyelids open periodically, if appropriate. Remove and isolate contaminated clothing and shoes at the site. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID If swallowed, may cause nausea, vomiting, diarrhea, abdominal pain and bleeding from the gut. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes; hold eyelids open periodically, if appropriate. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS, have victim drink water and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
<b>Water Pollution</b>	Harmful to aquatic life in very low concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $Tl_2CO_3$ 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 1707 2.5 CAS Registry No.: 6533-73-9 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 52379
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Thallium is one of the more toxic elements, both as an acute and a chronic poison. Effects of exposure are cumulative and onset of symptoms may be delayed 12 to 24 hours. May be fatal if inhaled, ingested or absorbed through the skin. Readily absorbed through the skin and digestive tract. Digestion of soluble thallium compounds has caused many deaths. Ingestion of sublethal quantities may cause nausea, vomiting, diarrhea, abdominal pain, and bleeding from the gut accompanied or followed by drooping eyelids, crossed eyes, weakness, numbness, tingling of arms and legs, trembling, tightness and pain in the chest. Loss of hair may occur in two to three weeks. Severe intoxication may cause prostration, rapid heartbeat, convulsions, and psychosis. Some effects may be permanent. 3.3 <b>Treatment of Exposure:</b> INHALATION: Move victim to fresh air; call emergency medical care. If breathing has stopped, give artificial respiration. EYES OR SKIN: Immediately flush with running water for at least 15 minutes, lifting the upper and lower lids occasionally, if appropriate. Speed in removing material from skin is important. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If conscious, have victim drink large quantities of water and induce vomiting by touching back of throat with a finger. If unconscious or having convulsions, do nothing except keep victim warm. 3.4 <b>TLV-TWA:</b> 0.1 mg/m <sup>3</sup> as thallium 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 4; LD <sub>50</sub> = 21 mg/kg (mouse) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Thallous ion causes mutagenic effects (chromosomal aberrations) in animals and plants, and teratogenic effects (detremental to the sexual behavior, reproductive organs, egg and fetal development, and survival of the chicken). It also causes liver and kidney damage, hair loss and permanent effects such as staggering, visual difficulties, trembling and mental abnormalities. Chronic oral or cutaneous exposure of mice to thallium caused cancer of the female genital tract. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Not pertinent 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 15 mg/m <sup>3</sup> (as thallium) 3.14 <b>OSHA PEL-TWA:</b> 0.1 mg/m <sup>3</sup> as thallium 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Extinguish adjacent fires with dry chemical, carbon dioxide, water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** When heated to decomposition, it emits toxic fumes of thallium.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1,800 ppm (Tl)/48 hr/fathead minnow/LC<sub>50</sub>/fresh water  
20.9 ppm (Tl)/sheepshead minnow/LC<sub>50</sub>/salt water  
6.2 **Waterfowl Toxicity:** Approximate oral mean lethal dose in domestic mallards and wild white geese: 28 mg/kg (dry thallous carbonate);  
14 mg/kg (in solution or coated on grain). Toxicity estimates are based on approximate values for water soluble thallous sulfate.  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** Plants growing in soils or water with very high thallium content may accumulate sufficient thallium to be toxic to organisms that feed on them. Algae from contaminated water exhibited a thallium bioconcentration factor of >430. Other bioconcentration factors that have been reported include 130 for atlantic salmon mussel and 18 for the edible portions of softshell clams. Thallium is a cumulative poison four times as toxic as arsenious oxide.  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Not listed  
7.4 **Venting:** Not pertinent  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	-
Instability (Yellow).....	-

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U215  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 468.75  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** 521.6°F = 272°C = 545°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 7.11 at 25°C (room temperature)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# THALLIUM CARBONATE

THB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	5.300		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# THIOCARBAMIDE

THC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isothiourea Pseudothiourea Sulourea Thiourea 2-Thiourea Urea, thio-	Solid, crystal or powder  White, off-white   Sinks and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	POISONOUS GASES ARE PRODUCED WHEN HEATED TO DECOMPOSITION. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, CO <sub>2</sub> , water spray or foam; large fires: water spray, fog or foam. Move containers from fire area if you can do it without risk.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Poisonous if inhaled. May irritate skin. Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Poisonous if swallowed. Irritating to skin. IF IN EYES OR ON SKIN, flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS, induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Harmful to aquatic life in very low concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{NH}_2\text{CSNH}_2$   
2.3 IMO/UN Designation: 6.1/2877  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: 62-56-6  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51463

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.  
3.2 **Symptoms Following Exposure:** Poisonous inhaled or swallowed. Irritating to skin; may cause allergic skin eruptions.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. SKIN OR EYES: flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. INGESTION: if conscious, induce vomiting.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 125 mg/kg (rat); varies with different strains of rats; less toxic to some strains.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Can cause cancer; mutagenic, teratogenic and tumorigenic effects.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam; large fires: water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** May contain highly toxic fumes of NO<sub>x</sub> and SO<sub>x</sub>.  
4.6 **Behavior in Fire:** When heated to decomposition, it produces very toxic NO<sub>x</sub> and SO<sub>x</sub> fumes.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Incompatible with metals.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Cautistics:** Neutralize with six normal hydrochloric acid.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.8 mg/l/time unknown/daphnia magna/LC<sub>50</sub>/fresh water  
>100 mg/l/time unknown/fathead minnow/LC<sub>50</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 1.3%, 5 days  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Not listed  
7.4 **Venting:** Not listed  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 76.12  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** 347-351°F. = 175-177°C. = 448-450°K.  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.405 at 20°C.  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 2.6 (est.)  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** -126.0 Btu/lb = -70.02 cal/g = -2.932 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# THIOCARBAMIDE

THC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	87.700		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
55	9.200		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# TETRAHYDROFURAN

THF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Diethylene oxide Tetramethylene oxide THF	Liquid  Colorless  Faint fruity odor  Floats and mixes with water. Flammable, irritating vapor is produced.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, headache or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 41; Ether  
2.2 Formula:  $\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{O}$   
2.3 IMO/UN Designation: 3.1/2056  
2.4 DOT ID No.: 2056  
2.5 CAS Registry No.: 109-99-9  
2.6 NAERG Guide No.: 127  
2.7 Standard Industrial Trade Classification: 51659

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus; goggles or face shield; rubber or plastic gloves.
- 3.2 **Symptoms Following Exposure:** Vapors cause nausea, dizziness, headache, and anesthesia. Liquid can de-fat the skin and cause irritation. Liquid also irritates eyes.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from contaminated area; administer artificial respiration and oxygen if necessary. INGESTION: gastric lavage and saline cathartics are usually helpful; subsequent treatment is symptomatic and supportive. SKIN OR EYE CONTACT: wash with copious amounts of water.
- 3.4 **TLV-TWA:** 200 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** 250 ppm.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 50 to 500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 20-50 ppm
- 3.13 **IDLH Value:** 2,000 ppm.
- 3.14 **OSHA PEL-TWA:** 200 ppm.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 6°F C.C.  
-4°F O.C.
- 4.2 **Flammable Limits in Air:** 1.8%-11.8%
- 4.3 **Fire Extinguishing Agents:** Dry chemical or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Irritating vapor is generated when heated.
- 4.6 **Behavior in Fire:** May explode. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 610°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 4.7 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable unless 0.1% of peroxides has accumulated because of prolonged storage in presence of air. When concentrated by evaporation of solution, they explode.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** 0.025% butylated hydroxytoluene (BHT) present to prevent peroxide formation.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Padded
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** D
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** U213
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 72.10
- 9.3 **Boiling Point at 1 atm:** 151°F = 66°C = 339°K
- 9.4 **Freezing Point:** -163.3°F = -108.5°C = 164.7°K
- 9.5 **Critical Temperature:** 512.6°F = 267.0°C = 540.2°K
- 9.6 **Critical Pressure:** 753 psia = 51.2 atm = 5.19 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.888 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 28 dynes/cm = 0.028 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.083
- 9.12 **Latent Heat of Vaporization:** 180 Btu/lb = 98 cal/g = 4.1 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -14,990 Btu/lb = -8330 cal/g = -348.8 X 10<sup>6</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 7.7 psia

### NOTES

# TETRAHYDROFURAN

THF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	56.750	0	0.372		N		N
40	56.560	10	0.376		O		O
45	56.370	20	0.380		T		T
50	56.180	30	0.384				
55	55.990	40	0.388		P		P
60	55.800	50	0.392		E		E
65	55.610	60	0.397		R		R
70	55.420	70	0.401		T		T
75	55.230	80	0.405		I		I
80	55.040	90	0.409		N		N
85	54.850	100	0.413		E		E
90	54.650	110	0.417		N		N
95	54.460	120	0.422		T		T
100	54.270	130	0.426				
105	54.080	140	0.430				
110	53.890	150	0.434				
115	53.700						
120	53.510						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M	0	0.336	0	0.00491	100	0.375
	I	5	0.397	5	0.00574	120	0.384
	S	10	0.467	10	0.00668	140	0.393
	C	15	0.547	15	0.00774	160	0.402
	I	20	0.639	20	0.00895	180	0.411
	B	25	0.744	25	0.01031	200	0.420
	L	30	0.864	30	0.01185	220	0.428
	E	35	0.999	35	0.01357	240	0.437
		40	1.153	40	0.01550	260	0.445
		45	1.327	45	0.01766	280	0.454
		50	1.522	50	0.02006	300	0.462
		55	1.742	55	0.02273	320	0.470
		60	1.988	60	0.02570	340	0.478
		65	2.264	65	0.02898	360	0.486
		70	2.571	70	0.03260	380	0.494
		75	2.913	75	0.03660	400	0.501
		80	3.293	80	0.04099	420	0.509
		85	3.714	85	0.04580	440	0.516
		90	4.180	90	0.05108		
		95	4.694	95	0.05684		
		100	5.261	100	0.06313		
		105	5.884	105	0.06999		
		110	6.568	110	0.07744		
		115	7.317	115	0.08552		
		120	8.137	120	0.09428		
		125	9.032	125	0.10380		

# TRIMETHYLHEXAMETHYLENE DIISOCYANATE

THI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hexane, 1,6-diisocyanato-2,2,4(2,4,4)-trimethyl-		Liquid	Colorless or yellowish
		Reacts with water to produce carbon dioxide and the diamine.	
<b>Keep people away. Avoid contact with liquid and vapor. Wear positive pressure breathing apparatus and special chemical protective suit. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>			
<b>Fire</b>	Combustible POISONOUS GASES ARE PRODUCED IN FIRE. Wear self-contained positive pressure breathing apparatus and special chemical protective suit. Extinguish small fires with dry chemical, CO <sub>2</sub> , water spray, or foam; large fires with water spray, fog, or foam. (It reacts with water to produce carbon dioxide and the corresponding diamine.)		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS. MAY BE FATAL IF INHALED OR ABSORBED THROUGH SKIN. Contact may cause burns to skin and eyes. Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS. MAY BE FATAL IF SWALLOWED OR ABSORBED THROUGH SKIN. Contact may burn skin and eyes. Immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. If swallowed and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Dilute and disperse Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 <b>CG Compatibility Group:</b> 12; Isocyanates 2.2 <b>Formula:</b> C <sub>11</sub> H <sub>18</sub> N <sub>2</sub> O <sub>2</sub> 2.3 <b>IMO/UN Designation:</b> 6.1/2328 2.4 <b>DOT ID No.:</b> 2328 2.5 <b>CAS Registry No.:</b> (2,2,4- isomer): 16938-22-0 (2,4,4- isomer): 15646-96-5 2.6 <b>NAERG Guide No.:</b> 156 2.7 <b>Standard Industrial Trade Classification:</b> 51489
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Wear positive pressure breathing apparatus and special protective clothing. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Poisonous; may be fatal if inhaled. SKIN and EYES: May cause burns. Poisonous, may be fatal if absorbed through skin. INGESTION: Poisonous; May be fatal if swallowed. 3.3 <b>Treatment of Exposure:</b> INHALATION: Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES OR SKIN: Immediately flush with running water for at least 15 minutes. Hold eyelids open if necessary. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation. INGESTION: If the victim is unconscious or having convulsions, do nothing except keep victim warm. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Currently not available 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Small fires: Dry chemical, CO<sub>2</sub>, water spray or foam. Large fires: Water spray, fog or foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** May contain toxic decomposition products including NOx.
- 4.6 **Behavior in Fire:** Undergoes decomposition to yield toxic fumes, and it may react violently with alcohols in the presence of a base.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 78.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 22.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Can react with water to produce carbon dioxide and the diamine.
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Currently not available
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: -  
Human Contact hazard: 1  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed. Not listed.
- 8.7 **EPA Pollution Category:** Not listed. Not listed.
- 8.8 **RCRA Waste Number:** Not listed Not listed
- 8.9 **EPA FWPCA List:** Not listed Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 210.27
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** Currently not available
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 7.3
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# TRIMETHYLHEXAMETHYLENE DIISOCYANATE

THI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# TETRANITROMETHANE

TNM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> NCI-C55947 Tetan TNM	Liquid	Colorless or yellow	Pungent
Sinks in water.			
<b>Keep people away. Avoid contact with vapor or liquid.</b> <b>Evacuate</b> <b>Wear self-contained breathing apparatus and protective clothing and gloves.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control authorities.</b>			
<b>Fire</b>	COMBUSTIBLE. May explode when heated. Emits toxic fumes under fire conditions. Wear self-contained breathing apparatus and protective clothing. Extinguish with water spray, dry chemical, CO <sub>2</sub> , or foam.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be fatal if inhaled or absorbed through the skin. Irritating to the eyes, nose, throat, and lungs. Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID May be fatal if ingested or absorbed through the skin. Effects may be delayed. Causes eye and skin irritation. IF IN EYES: hold eyelids open, flush with running water for at least 15 minutes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF SWALLOWED: DO NOT INDUCE VOMITING. Keep victim quiet and maintain normal body temperature.		
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed 2.2 Formula: C(NO <sub>2</sub> ) <sub>4</sub> 2.3 IMO/UN Designation: 5.1/1510 2.4 DOT ID No.: 1510 2.5 CAS Registry No.: 509-14-8 2.6 NAERG Guide No.: 143 2.7 Standard Industry Trade Classification: 51140
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Approved respirator, safety goggles, chemical resistant gloves, other protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Irritating to mucous membranes, upper respiratory tract, nose and eyes. Absorption into the body leads to the formation of methemoglobin which may lead to cyanosis. Onset may be delayed 2 to 4 hours or longer. Central nervous system depressant. 3.3 <b>Treatment of Exposure:</b> EYES: Hold eyelids open and flush with running water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes. Flush affected areas with running water for at least 15 minutes. Wash contaminated clothing before reuse. INGESTION: Call a physician. 3.4 <b>TLV-TWA:</b> 0.005 ppm 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; LD <sub>50</sub> = 130 mg/kg (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> May cause cyanosis due to formation of methemoglobin. Damage to heart and eyes. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations. 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 4 ppm 3.14 <b>OSHA PEL-TWA:</b> 1 ppm 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** >230°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water spray, CO<sub>2</sub>, dry chemical, foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic fumes of NO<sub>x</sub>.
- 4.6 **Behavior in Fire:** May be explosive.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 4.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 5.0 (calc.)
- 4.14 **Maximum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity in Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Incompatible with finely divided metals, iron and iron salts, copper, brass, zinc, or rubber.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98%
- 7.2 **Storage Temperature:** Refrigerate
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** None
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer
- 8.2 **49 CFR Class:** 5.1
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 4              |
- 8.6 **EPA Reportable Quantity:** 10 pounds 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** P112
- 8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 196.03
- 9.3 **Boiling Point at 1 atm:** 259°F = 126°C = 399°K
- 9.4 **Freezing Point:** 56°F = 13.5°C = 286.7°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.6380 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 6.76
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** 188 Btu/lb = 104 cal/g = 4.4 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.5 psia

## NOTES

# TETRANITROMETHANE

TNM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	102.260		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250	0.226 0.339 0.487 0.676 0.912 1.202 1.551 1.967 2.457 3.027 3.686 4.441 5.299 6.269 7.358 8.575 9.929 11.429		C U R R E N T L Y  N O T  A V A I L A B L E	25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.165 0.170 0.175 0.180 0.184 0.189 0.194 0.199 0.204 0.208 0.213 0.218 0.223 0.228 0.233 0.237 0.242 0.247 0.252 0.257 0.261 0.266 0.271 0.276

# TETRAHYDRONAPHTHALENE

THN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2,3,4-Tetrahydronaphthalene Tetralin Tetramp Tetranap	Watery liquid  Colorless  Moldy, turpentine odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Chemical and Physical Treatment: Absorb Clean shore line Salvage waterfowl	<b>2. CHEMICAL DESIGNATIONS</b> <b>2.1 CG Compatibility Group:</b> 32; Aromatic Hydrocarbon <b>2.2 Formula:</b> C <sub>10</sub> H <sub>12</sub> <b>2.3 IMO/UN Designation:</b> Not listed <b>2.4 DOT ID No.:</b> Not listed <b>2.5 CAS Registry No.:</b> 119-64-2 <b>2.6 NAERG Guide No.:</b> Not listed <b>2.7 Standard Industrial Trade Classification:</b> 51129
<b>3. HEALTH HAZARDS</b> <b>3.1 Personal Protective Equipment:</b> Air-supplied mask in closed tanks; goggles or face shield; rubber gloves. <b>3.2 Symptoms Following Exposure:</b> Liquid may cause nervous disturbance, green coloration of urine, and skin and eye irritation <b>3.3 Treatment of Exposure:</b> INGESTION: induce vomiting; call a doctor; medical treatment should be aimed at conservation of liver and kidney function. EYES: flush with water for at least 15 min; call a doctor. SKIN: wipe off, wash with soap and water. <b>3.4 TLV-TWA:</b> Not listed. <b>3.5 TLV-STEL:</b> Not listed. <b>3.6 TLV-Ceiling:</b> Not listed. <b>3.7 Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg <b>3.8 Toxicity by Inhalation:</b> Currently not available. <b>3.9 Chronic Toxicity:</b> Liver and kidney damage from high dose. <b>3.10 Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. <b>3.11 Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. <b>3.12 Odor Threshold:</b> Currently not available <b>3.13 IDLH Value:</b> Not listed. <b>3.14 OSHA PEL-TWA:</b> Not listed. <b>3.15 OSHA PEL-STEL:</b> Not listed. <b>3.16 OSHA PEL-Ceiling:</b> Not listed. <b>3.17 EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point:** 190°F O.C. 176°F C.C.  
**4.2 Flammable Limits in Air:** 0.8%-5%  
**4.3 Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
**4.4 Fire Extinguishing Agents Not to Be Used:** Avoid water  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Not pertinent  
**4.7 Auto Ignition Temperature:** 725°F  
**4.8 Electrical Hazards:** Not pertinent  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 61.9 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 16.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** 78 ppm/24 hr/brine shrimp/TL<sub>m</sub>  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** 0 lb/lb, 5 days  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 90+%  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester)  
**7.5 IMO Pollution Category:** C  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed  
**8.2 49 CFR Class:** Not pertinent  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 132.21  
**9.3 Boiling Point at 1 atm:** 406°F = 208°C = 481°K  
**9.4 Freezing Point:** -23.1°F = 30.6°C = 242.6°K  
**9.5 Critical Temperature:** Not pertinent  
**9.6 Critical Pressure:** Not pertinent  
**9.7 Specific Gravity:** 0.974 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** 35.5 dynes/cm = 0.0355 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
**9.12 Latent Heat of Vaporization:** 138 Btu/lb = 76.5 cal/lb = 3.20 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -18,400 Btu/lb = -10,200 cal/g = -429 X 10<sup>3</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 0.02 psia

## NOTES

# TETRAHYDRONAPHTHALENE

THN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	61.730	34	0.400	50	0.908	55	2.499
36	61.660	36	0.400	52	0.908	60	2.365
38	61.590	38	0.400	54	0.908	65	2.240
40	61.520	40	0.400	56	0.908	70	2.124
42	61.450	42	0.400	58	0.908	75	2.016
44	61.380	44	0.400	60	0.908	80	1.916
46	61.310	46	0.400	62	0.908	85	1.822
48	61.240	48	0.400	64	0.908	90	1.734
50	61.170	50	0.400	66	0.908	95	1.652
52	61.100	52	0.400	68	0.908	100	1.576
54	61.040	54	0.400	70	0.908	105	1.504
56	60.970	56	0.400	72	0.908	110	1.436
58	60.900	58	0.400	74	0.908	115	1.373
60	60.830	60	0.400	76	0.908	120	1.313
62	60.760	62	0.400	78	0.908	125	1.257
64	60.690	64	0.400	80	0.908	130	1.205
66	60.620	66	0.400	82	0.908	135	1.155
68	60.550	68	0.400	84	0.908	140	1.108
70	60.480	70	0.400			145	1.064
72	60.410	72	0.400			150	1.022
74	60.340	74	0.400			155	0.983
76	60.270	76	0.400			160	0.945
78	60.200	78	0.400			165	0.910
80	60.130	80	0.400			170	0.877
82	60.060	82	0.400			175	0.845
84	60.000	84	0.400				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	80	0.012	80	0.00029		N
	N	100	0.025	100	0.00054		O
	S	120	0.046	120	0.00098		T
	O	140	0.082	140	0.00169		
	L	160	0.142	160	0.00283		P
	U	180	0.238	180	0.00458		E
	B	200	0.386	200	0.00720		R
	L	220	0.607	220	0.01100		T
	E	240	0.931	240	0.01640		I
		260	1.395	260	0.02388		N
		280	2.045	280	0.03405		E
		300	2.937	300	0.04762		N
		320	4.141	320	0.06541		T
		340	5.739	340	0.08838		
		360	7.827	360	0.11760		
		380	10.520	380	0.15430		

# THIRAM

THR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>  Bis(Dimethylthiocarbamyl)disulfide Methyl thiram Methyl tuads Tetramethyl thiuiram disulfide Thiuram	Solid White to light yellow  Sinks in water.
Call fire department. <b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear goggles and dust respirator. Stay upwind. Use water spray to "knock down" dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.
- 2.2 **Formula:** (CH<sub>3</sub>)<sub>2</sub>NC(S)SSC(S)N(CH<sub>3</sub>)<sub>2</sub> or C<sub>4</sub>H<sub>12</sub>N<sub>2</sub>S<sub>2</sub>
- 2.3 **IMO/UN Designation:** 6.1/2771
- 2.4 **DOT ID No.:** 2771
- 2.5 **CAS Registry No.:** 137-26-8
- 2.6 **NAERG Guide No.:** 151
- 2.7 **Standard Industrial Trade Classification:** 51542

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves; goggles; dust mask
- 3.2 **Symptoms Following Exposure:** Inhalation of dust may cause respiratory irritation. Liquid irritates eyes and skin and may cause allergic eczema in sensitive individuals. Ingestion causes nausea, vomiting, and diarrhea, all of which may be persistent; paralysis may develop.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; if breathing has stopped or is difficult, give artificial respiration and call physician. EYES or SKIN: wash with water; if irritation persists, consult a physician. INGESTION: call physician; induce vomiting and follow with gastric lavage; treatment thereafter is symptomatic and supportive; avoid fats, oils, and lipid solvents, which enhance absorption; rigorously prohibit ethyl alcohol in all forms for at least 10 days; inform doctor if patient has used alcohol within 48 hrs.
- 3.4 **TLV-TWA:** 1 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 560 mg/kg (rat); 375-865 mg/kg (mammal)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes birth defects in mice and hamsters
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 100 mg/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 5 mg/m<sup>3</sup>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (solid)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic and irritating oxides of sulfur are formed. Carbon disulfide may be formed from unburned material.
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 71.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.76 ppm/96 hr/catfish/TL<sub>m</sub>/fresh water
- 6.2 **Waterfowl Toxicity:** LD<sub>50</sub> = 2800 mg/kg
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98% plus 2% oil
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 10 pounds
- 8.7 **EPA Pollution Category:** A
- 8.8 **RCRA Waste Number:** U244
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 240.4
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 288–313°F = 142–156°C = 415–429°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.43 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# THIRAM

THR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# TRIISOBUTYLALUMINUM

TIA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Aluminum triisobutyl TIBA Tibal	Liquid  Colorless  IGNITES WHEN EXPOSED TO AIR. Flammable gas is produced on contact with water.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources and call fire department. Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	IGNITES WHEN EXPOSED TO AIR. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry graphite, soda ash, or other inert powder. DO NOT USE WATER, FOAM, CARBON DIOXIDE, DRY CHEMICALS OR VAPORIZING LIQUIDS ON FIRE.
<b>Exposure</b>	Call for medical aid.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: (iso-C<sub>4</sub>H<sub>9</sub>)<sub>3</sub>Al
- 2.3 IMO/UN Designation: 4.2/1930
- 2.4 DOT ID No.: Not listed.
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full protective clothing, preferably of aluminized glass cloth; goggles; face shield; gloves. In case of fire, all-purpose canister or self-contained breathing apparatus.
- 3.2 **Symptoms Following Exposure:** Inhalation of smoke from fire causes metal-fume fever (flu-like symptoms). Contact with liquid can cause severe burns of eyes and skin because of spontaneous ignition.
- 3.3 **Treatment of Exposure:** INHALATION: only fumes from fire need be considered; metal-fume fever lasts less than 36 hrs. and is not critical. EYES: flush gently with copious quantities of water for 15 min. with lids open; treat burns, if fire occurred; get medical attention. SKIN: wash with water; treat burns caused by fire; get medical attention. INGESTION: not pertinent
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Not pertinent
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Metal fume fever may develop following exposure to smoke from fire.
- 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent
- 3.11 Liquid or Solid Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent (ignites spontaneously)
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Inert powder (e.g., sand, limestone), dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam, halogenated extinguishing agents
- 4.5 **Special Hazards of Combustion Products:** Dense smoke may cause metal-fume fever.
- 4.6 **Behavior in Fire:** Dense smoke of aluminum oxide forms.
- 4.7 **Auto Ignition Temperature:** Ignites spontaneously under ambient conditions
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 92.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 26.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts violently to form flammable hydrocarbon gases
- 5.2 **Reactivity with Common Materials:** Not compatible with silicone rubber or urethane rubber
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Not pertinent
- 6.2 **Waterfowl Toxicity:** Not pertinent
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 95+%; 20% or less by weight in benzene, hexane, or heptane (solutions are not pyrophoric); electronic grade.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Inerted; dry nitrogen at 5 psig.
- 7.4 **Venting:** Safety relief, with rupture disc
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	3
Instability (Yellow).....	3
Special (White).....	W

\* Refers to 20% or less by weight in hydrocarbon solution.

- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 198.3
- 9.3 **Boiling Point at 1 atm:** 414°F = 212°C = 485°K
- 9.4 **Freezing Point:** 33.8°F = 1.0°C = 274.2°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.788 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** (est.) 24 dynes/cm = 0.024 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** 101 Btu/ = 56 cal/g = 2.3 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -18,423 Btu/lb = -10,235 cal/g = -428.23 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRIISOBUTYLALUMINUM

TIA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
40	50.200	52	0.526	52	1.129	55	2.739
50	49.830	54	0.527	54	1.129	60	2.555
60	49.460	56	0.528	56	1.129	65	2.386
70	49.090	58	0.529	58	1.129	70	2.232
80	48.720	60	0.531	60	1.129	75	2.090
90	48.350	62	0.532	62	1.129	80	1.959
100	47.980	64	0.533	64	1.129	85	1.839
110	47.610	66	0.534	66	1.129	90	1.728
120	47.230	68	0.535	68	1.129	95	1.626
130	46.860	70	0.536	70	1.129	100	1.531
140	46.490	72	0.537	72	1.129	105	1.444
150	46.120	74	0.538	74	1.129	110	1.362
160	45.750	76	0.539	76	1.129	115	1.287
170	45.380	78	0.541	78	1.129	120	1.217
180	45.010	80	0.542	80	1.129	125	1.152
190	44.640	82	0.543	82	1.129	130	1.092
200	44.270	84	0.544	84	1.129	135	1.035
210	43.890	86	0.545	86	1.129	140	0.983
						145	0.933
						150	0.887
						155	0.844
						160	0.804
						165	0.766
						170	0.731
						175	0.698

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	135	0.030	135	0.00092		N
	E	140	0.035	140	0.00109		O
	A	145	0.042	145	0.00128		T
	C	150	0.050	150	0.00151		
	T	155	0.059	155	0.00177		P
	S	160	0.069	160	0.00206		E
		165	0.081	165	0.00239		R
		170	0.095	170	0.00277		T
		175	0.110	175	0.00321		I
		180	0.128	180	0.00369		N
		185	0.148	185	0.00424		E
		190	0.171	190	0.00486		N
							T



# TRIISOBUTYLENE

TIB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isobutene trimer 1-Propene, 2-methyl trimer Triisobutene UN 2324 (DOT)	Liquid  Floats on water.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	FLAMMABLE. Water may be ineffective on fire. Extinguish with dry chemical, foam, or CO <sub>2</sub> . Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, induce vomiting immediately.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefins  
2.2 Formula: (C<sub>4</sub>H<sub>8</sub>)<sub>3</sub>  
2.3 IMO/UN Designation: 3.3/2324  
2.4 DOT ID No.: 2324  
2.5 CAS Registry No.: 7756-94-7  
2.6 NAERG Guide No.: 128  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear approved respirator, chemical resistant gloves or mask, apron, safety goggles and boots.
- 3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion or absorption. May cause eye and skin irritation.
- 3.3 **Treatment of Exposure:** INHALATION: Consult a physician. Remove the victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Induce vomiting immediately. EYES: Hold the eyelids open and flush with plenty of water for 15 minutes. SKIN: Wash with soap and water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water, carbon dioxide, foam, dry chemical.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Emits toxic fumes upon decomposition.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 85.7 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 24.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** No reaction.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not occur.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Ambient.
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 168.32
- 9.3 **Boiling Point at 1 atm:** 350.6°F = 177°C = 450.2°K
- 9.4 **Freezing Point:** -104.8°F = -76°C = 197.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.77
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 5.8
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.0754 psia

### NOTES

# TRIISOBUTYLENE

TIB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	64 111 134 158 188 206 230 266 307 354	0.019 0.097 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.337 0.352 0.367 0.381 0.395 0.409 0.423 0.436 0.449 0.462 0.475 0.487 0.499 0.512 0.523 0.535 0.546 0.557 0.568 0.579 0.590 0.600 0.610 0.620 0.630

# TRIIISOPROPANOLAMINE

TIP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Tris(2-Hydroxypropyl) amine 2-Propanol 1,1,1'-nitritoltri- Tri-iso-propanolamine	Solid  White  Slight ammonia  Sinks and dissolves in water.
Avoid contact with solid and dust. Restrict access. Wear body-covering clothing, rubber gloves, apron, boots, full-face mask or amine vapor mask. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE. TOXIC FUMES PRODUCED AT DECOMPOSITION TEMPERATURE. Wear body-covering clothing, rubber gloves, apron, boots, full-face mask or amine vapor mask. Extinguish with water fog, alcohol foam, carbon dioxide, or dry chemical. Water or alcohol foam may cause frothing. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to eyes and skin. May cause slight corneal injury or burn. Low to moderately toxic by oral routes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and irrigate with plenty of water for 15 minutes. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 8; Alkanolamine  
2.2 Formula: ((CH<sub>3</sub>CHOH)CH<sub>2</sub>)<sub>3</sub>N  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51461

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Clean, body-covering clothing, rubber gloves, apron, boots, and face shield as dictated by circumstances. Approved, full-face mask or amine vapor mask only if required during a fire.
- 3.2 **Symptoms Following Exposure:** Irritation of eyes and skin. May cause slight corneal injury or burn. Repeated contact may cause skin burn. Heated vapor may cause moderate respiratory irritation. Low to moderately toxic by oral routes.
- 3.3 **Treatment of Exposure:** INHALATION: Move to fresh air if effects occur. Call physician and/or transport to medical facility. INGESTION: Induce vomiting immediately by giving two glasses of water and sticking finger down throat. Call a physician. No known antidote. Treat symptomatically. EYES: Irrigate with flowing water immediately and continuously for 15 minutes. Refer to physician. SKIN: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash clothing before reuse; destroy contaminated shoes.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 1.08 to 3.6 g/kg (guinea pigs)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapor causes moderate irritation such that personnel will find high concentration unpleasant.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. Dust causes eye irritation.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 320°F O.C.  
4.2 **Flammable Limits in Air:** 0.8% (Calc) - 5.1% (est.)  
4.3 **Fire Extinguishing Agents:** Water fog, alcohol foam, CO<sub>2</sub>, dry chemical. (Water or alcohol foam may cause frothing.)  
4.4 **Fire Extinguishing Agents Not to Be Used:** Ordinary foam.  
4.5 **Special Hazards of Combustion Products:** Toxic fumes containing carbon monoxide, and/or carbon dioxide, and oxides of nitrogen.  
4.6 **Behavior in Fire:** Toxic fumes containing carbon monoxide, and/or carbon dioxide, and oxides of nitrogen.  
4.7 **Auto Ignition Temperature:** 608°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 67.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 20.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Avoid oxidizing materials and strong acids.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush heavily with water.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 191.27  
9.3 **Boiling Point at 1 atm:** 572-581°F = 300-305°C = 573-578°K  
9.4 **Freezing Point:** 136°F = 58°C = 331°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.0200 at 20°C  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 6.60  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Not pertinent

### NOTES

# TRIISOPROPANOLAMINE

TIP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	140	138.000

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# THALLIUM ACETATE

TLA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, thallium (I) salt Acetic acid, thallous salt Thallium (I) acetate Thallium monoacetate Thallous acetate	Solid (crystals)      White      Odorless  Sinks and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Nonflammable. Poisonous and irritating fumes are produced in a fire or when heated. Wear self-contained positive pressure breathing apparatus and full protective clothing. Extinguish small fires: dry chemical, carbon dioxide, water spray, or foam; large fires: water spray, fog or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS. MAY BE FATAL IF INHALED OR ABSORBED THROUGH SKIN. ONSET OF SYMPTOMS MAY BE DELAYED SEVERAL HOURS. If in eyes or on skin, flush with running water for at least 15 minutes holding eyelids open periodically, if appropriate. Remove and isolate contaminated clothing and shoes at the site. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS. MAY BE FATAL IF SWALLOWED OR ABSORBED THROUGH SKIN. ONSET OF SYMPTOMS DELAYED 12 TO 24 HOURS AFTER INGESTION. If swallowed, may cause nausea, vomiting, diarrhea, and abdominal pain. IF IN EYES OR ON SKIN, flush with running water for at least 15 minutes, hold eyelids open periodically if appropriate. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS, have victim drink water and induce vomiting by touching a finger to the back of the throat. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim quiet and maintain body temperature.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CH<sub>3</sub>CO<sub>2</sub>TI  
2.3 IMO/UN Designation: 6.1/1707  
2.4 DOT ID No.: 1707  
2.5 CAS Registry No.: 563-68-8  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 51372

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Thallium is one of the more toxic elements both as an acute and a chronic poison. Effects of exposure are cumulative and onset of symptoms may be delayed 12 to 24 hours. May be fatal if inhaled, ingested or absorbed through the skin. Irritating to skin and eyes. Readily absorbed through the skin and digestive tract. Ingestion of soluble thallium compounds has caused many deaths. Ingestion of sublethal quantities may cause nausea, vomiting, diarrhea, abdominal pain, and bleeding from the gut accompanied or followed by drooping eyelids, crossed eyes, weakness, numbness, tingling of arms and legs, trembling, tightness and pain in the chest. Loss of hair may occur in two to three weeks. Severe intoxication may cause prostration, rapid heartbeat, convulsions, and psychosis. Some effects may be permanent.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air; call emergency medical care. If breathing has stopped, give artificial respiration. EYES OR SKIN: Immediately flush with running water for at least 15 minutes, lifting the upper and lower lids occasionally, if appropriate. Speed in removing material from skin is important. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If conscious, have victim drink large quantities of water and induce vomiting by touching the back of throat with a finger. If unconscious or having convulsions, do nothing except keep victim warm.
- 3.4 TLV-TWA: 0.1 mg TI/m<sup>3</sup>
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> = 35 mg/kg (mouse)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Thallous ion causes mutagenic effects (chromosomal aberrations) in animals and plants, and teratogenic effects (detrimental to the sexual behavior, reproductive organs, egg and fetal development, and survival of the chicken). It also causes liver and kidney damage, hair loss and permanent effects such as staggering, visual difficulties, trembling, and mental abnormalities. Chronic oral or cutaneous exposure of mice to thallium caused cancer of the female genital tract.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Causes skin and eye irritation
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** 15 mg TI/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 0.1 mg/m<sup>3</sup> as thallium
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent
- 4.2 **Flammable Limits in Air:** Not pertinent
- 4.3 **Fire Extinguishing Agents:** Use an agent appropriate for the surrounding fire.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Contain toxic thallium fumes.
- 4.6 **Behavior in Fire:** Decomposes to produce toxic thallium fumes.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.03 ppm TI/atlantic salom/LD<sub>50</sub> 10 ppm TI/96 hr./brown shrimp/LC<sub>50</sub>
- 6.2 **Waterfowl Toxicity:** Approximate oral mean lethal dose in domestic mallards and wild white geese: 31 mg/kg (dry thallous acetate);  
16 mg/kg (in solution or coated on grain)
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Plants growing in soils or water with very high thallium content may accumulate sufficient thallium to be toxic to organisms that feed on them. Algae from contaminated water exhibited thallium bioconcentration factor of >430. Other bioconcentration factors that have been reported include 130 for atlantic salmon mussel and 18 for the edible portion of softshell clams. Thallium is a cumulative poison four times as toxic as arsenious oxide.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Not listed
- 7.4 **Venting:** Not pertinent
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison, B
- 8.2 **49 CFR Class:** 6
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** U214
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 263.42
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 267.8°F = 131°C = 404.2°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 3.765 at 137°C
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Not pertinent

### NOTES

# THALLIUM ACETATE

TLA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# O-TOLUIDINE

TLI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 2-Amino-1-methylbenzene 2-Aminotoluene 2-Methylaniline o-Methylaniline	Liquid  Colorless to yellow-brown  Chemical odor  May float or sink in water.
Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Skim; Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 1, 2-CH<sub>3</sub>CaHNH<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/1708  
2.4 DOT ID No.: 1708  
2.5 CAS Registry No.: 95-53-4  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51454

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles; face shield; Bu. Mines approved respirator; leather or rubber safety shoes; butyl rubber gloves
- 3.2 **Symptoms Following Exposure:** Absorption of toxic quantities by any route causes cyanosis (blue discoloration of lips, nails, skin); nausea, vomiting, and coma may follow. Repeated inhalation of low concentrations may cause pallor, low-grade secondary anemia, fatigability, and loss of appetite. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound. INHALATION: move to fresh air. INGESTION: if victim is conscious, promptly induce vomiting by giving lukewarm soapy water or mustard and water. EYES: flush with copious amounts of water for at least 15 min., holding lids apart. SKIN: remove all contaminated clothing; wash affected areas immediately and thoroughly with plenty of warm water and soap.
- 3.4 TLV-TWA: 2 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; oral LD<sub>50</sub> = 900 mg/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Causes tumors in urinary bladder of rats  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: 50 ppm  
3.14 OSHA PEL-TWA: 5 ppm  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 167°F O.C.  
85°C C.C.
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
- 4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen and flammable vapors may form in fire.
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: 900°F
- 4.8 Electrical Hazards: I, D
- 4.9 Burning Rate: 3.62 mm/min.
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 48.8 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 12.5 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 100 ppm\*/fish/lethal/fresh water  
\*Time period not specified.
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): 143%, 5 days
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 99.5+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open (flame arrester)
- 7.5 IMO Pollution Category: C
- 7.6 Ship Type: 2
- 7.7 Barge Hull Type: 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 EPA Reportable Quantity: 100 pounds
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: U328
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 107.2
- 9.3 Boiling Point at 1 atm: 392°F = 200°C = 473°K
- 9.4 Freezing Point: -11°F = -24°C = 249°K
- 9.5 Critical Temperature: 789.8°F = 421°C = 694.2°K
- 9.6 Critical Pressure: 544 psia = 37.0 atm = 3.75 MN/m<sup>2</sup>
- 9.7 Specific Gravity: 0.998 at 20°C (liquid)
- 9.8 Liquid Surface Tension: 43.55 dynes/cm = 0.04355 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: 179.1 Btu/lb = 99.5 cal/g = 4.16 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: -16,180 Btu/lb = -8,990 cal/g = -376 X 10<sup>6</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# O-TOLUIDINE

TLI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	63.240	60	0.490	42	1.102	55	5.524
36	63.190	65	0.490	44	1.102	60	5.059
38	63.130	70	0.490	46	1.102	65	4.640
40	63.070	75	0.490	48	1.102	70	4.263
42	63.020	80	0.490	50	1.102	75	3.922
44	62.960	85	0.490	52	1.102	80	3.615
46	62.910	90	0.490	54	1.102	85	3.336
48	62.850	95	0.490	56	1.102	90	3.084
50	62.800	100	0.490	58	1.102	95	2.854
52	62.740	105	0.490	60	1.102	100	2.646
54	62.690	110	0.490	62	1.102	105	2.456
56	62.630	115	0.490	64	1.102	110	2.282
58	62.570	120	0.490	66	1.102	115	2.124
60	62.520	125	0.490	68	1.102	120	1.979
62	62.460	130	0.490	70	1.102		
64	62.410	135	0.490	72	1.102		
66	62.350	140	0.490	74	1.102		
68	62.300	145	0.490	76	1.102		
70	62.240			78	1.102		
72	62.190			80	1.102		
74	62.130			82	1.102		
76	62.080			84	1.102		
78	62.020						
80	61.960						
82	61.910						
84	61.850						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
86	1.800	220	0.541	220	0.00794		N
		230	0.685	230	0.00992		O
		240	0.863	240	0.01231		T
		250	1.079	250	0.01519		
		260	1.342	260	0.01862		P
		270	1.658	270	0.02269		E
		280	2.037	280	0.02750		R
		290	2.489	290	0.03316		T
		300	3.026	300	0.03978		I
		310	3.659	310	0.04748		N
		320	4.404	320	0.05641		E
		330	5.276	330	0.06672		N
		340	6.291	340	0.07856		T
		350	7.469	350	0.09212		
		360	8.831	360	0.10760		
		370	10.400	370	0.12520		
		380	12.200	380	0.14510		
		390	14.250	390	0.16750		



# TALLOW

TLO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Edible tallow Inedible tallow Tallow oil		Oily liquid	Dark yellow	Waxy odor
		Floats on water. Freezing point is 35°F-45°F.		
Call fire department. Notify local health and pollution control agencies.				
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.			
<b>Exposure</b>	Not harmful.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Ester  
2.2 Formula: Not pertinent  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 41130

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; protective clothing, if exposure to hot liquid is possible.  
3.2 **Symptoms Following Exposure:** Hot liquid can burn eyes and skin.  
3.3 **Treatment of Exposure:** Treat burns caused by hot liquid.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 0; LD<sub>50</sub> above 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Non-volatile  
3.11 **Liquid or Solid Characteristics:** None  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 509°F C.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water fog, carbon dioxide, or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 152%, 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0/BOD  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Acidless; buffing; industrial fancy; edible; inedible  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCL List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Very high  
9.4 **Freezing Point:** 35–45°F = 2–7°C = 275–280°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** (est.) 0.87 at 80°C (liquid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** (est.) –18,000 Btu/lb = –10,000 cal/g = –420 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.1 psia

### NOTES

# TALLOW

TLO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
175	53.060	190	0.478	64	1.040	212	16.500
180	53.060	195	0.478	66	1.040		
185	53.060	200	0.478	68	1.040		
190	53.060	205	0.478	70	1.040		
195	53.060	210	0.478	72	1.040		
200	53.060	215	0.478	74	1.040		
205	53.060	220	0.478	76	1.040		
210	53.060	225	0.478	78	1.040		
215	53.060	230	0.478	80	1.040		
220	53.060	235	0.478	82	1.040		
225	53.060	240	0.478	84	1.040		
230	53.060	245	0.478	86	1.040		
235	53.060	250	0.478	88	1.040		
240	53.060	255	0.478	90	1.040		
		260	0.478	92	1.040		
				94	1.040		
				96	1.040		
				98	1.040		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# TRIMETHYLAMINE

TMA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Liquefied compressed gas Colorless Fish or ammonia odor  Floats and mixes and boils on water. Poisonous, flammable visible vapor cloud is produced.
<b>Evacuate.</b> Keep people away. Avoid contact with liquid and vapor. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water. Let gas fires burn. Extinguish water solution fires with water spray, dry chemical, alcohol foam, or carbon dioxide.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> <b>POISONOUS IF INHALED.</b> Irritating to eyes, nose, and throat. Move to fresh air. IF IN EYES, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $(CH_3)_3N$
- 2.3 IMO/UN Designation: 2.0/1083
- 2.4 DOT ID No.: 1083
- 2.5 CAS Registry No.: 75-50-3
- 2.6 NAERG Guide No.: 118
- 2.7 Standard Industrial Trade Classification: 51451

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Vapor-proof goggles and face shield; rubber gloves; air- supplied mask.
- 3.2 **Symptoms Following Exposure:** Vapor irritates eyes, nose, and throat; high concentrations can cause pulmonary edema. Liquid burns eyes and skin.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air and call a doctor; give artificial respiration and oxygen if needed. EYES: flush with water for at least 15 min.; consult an eye doctor. SKIN: flush with water, wash with soap and water.
- 3.4 **TLV-TWA:** 5 ppm
- 3.5 **TLV-STEL:** 15 ppm
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** Less than 100 ppm
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (gas)
- 4.2 **Flammable Limits in Air:** 2.0%-11.6%
- 4.3 **Fire Extinguishing Agents:** Stop flow of gas. Use water, alcohol foam, dry chemical, or carbon dioxide on water solution fires.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
- 4.7 **Auto Ignition Temperature:** 374°F
- 4.8 **Electrical Hazards:** I, C
- 4.9 **Burning Rate:** 8 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 29.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Although water solutions may be neutralized with acetic acid, simple evaporation will remove all of the compound.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Anhydrous, 98.5+%; also shipped as 25-30% solution in water.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2.1
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	4
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 59.11
- 9.3 **Boiling Point at 1 atm:** 37.2°F = 2.9°C = 276.1°K
- 9.4 **Freezing Point:** -178.8°F = -117.1°C = 156.1°K
- 9.5 **Critical Temperature:** 320.2°F = 160.1°C = 433.3°K
- 9.6 **Critical Pressure:** 591 psia = 40.2 atm = 4.07 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.633 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 17.4 dynes/cm = 0.0174 N/m at -4°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 2.0
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.139
- 9.12 **Latent Heat of Vaporization:** 174 Btu/lb = 96.5 cal/g = 4.04 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -17,660 Btu/lb = -9,810 cal/g = -410.7 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -385 Btu/lb = -214 cal/g = -8.96 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** 26.47 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available \*Physical properties apply to anhydrous material.

### NOTES

# TRIMETHYLAMINE

TMA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
10	41.930	0	0.490		N		N
15	41.720	10	0.498		O		O
20	41.510	20	0.506		T		T
25	41.300	30	0.513		P		P
30	41.100				E		E
35	40.890				R		R
					T		T
					I		I
					N		N
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# TRIMETHYLCHLOROSILANE

TMC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlorotrimethylsilane Trimethylsilyl chloride	Liquid	Colorless	Sharp irritating odor
Reacts violently with water. Irritating gas is produced on contact with water.			
<b>Evacuate.</b> Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE. Cool exposed containers with water.		
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $(\text{CH}_3)_3\text{SiCl}$   
2.3 IMO/UN Designation: 3.2/1298  
2.4 DOT ID No.: 1298  
2.5 CAS Registry No.: 75-77-4  
2.6 NAERG Guide No.: 155  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Acid-vapor-type respiratory protection; rubber gloves; chemical worker's goggles; other protective equipment as necessary to protect skin and eyes.  
3.2 **Symptoms Following Exposure:** Inhalation of vapor irritates mucous membranes. Contact of liquid with eyes or skin causes severe burns. Ingestion causes severe burns of mouth and stomach.  
3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove victim from exposure; if breathing is difficult or stopped, give artificial respiration. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; give large amount of water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50} = 0.5$  to  $5$  g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:**  
-18°F C.C.; 0°F O.C.  
4.2 **Flammable Limits in Air:** 1.8% (LFL); 6.0% (UFL)  
4.3 **Fire Extinguishing Agents:** Dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam  
4.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen chloride and phosgene may be formed in fires.  
4.6 **Behavior in Fire:** Difficult to extinguish; re-ignition may occur. Contact with water applied to adjacent fires produces irritating hydrogen chloride gas.  
4.7 **Auto Ignition Temperature:** 743°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** 5.3 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 28.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** Reacts vigorously, evolving hydrogen chloride (hydrochloric acid).  
5.2 **Reactivity with Common Materials:** Reacts with surface moisture to evolve hydrogen chloride, which will corrode common metals and form flammable hydrogen gas.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: (1)  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 98+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	2
Special (White).....	W

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 108.7  
9.3 **Boiling Point at 1 atm:** 135°F = 57°C = 330°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.846 at 25°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 17.8 dynes/cm = 0.0178 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 3.7  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.0683  
9.12 **Latent Heat of Vaporization:** 126 Btu/lb = 70 cal/g =  $2.9 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** (est.) -10,300 Btu/lb = -5,700 cal/g =  $-240 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRIMETHYLCHLOROSILANE

TMC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
42	53.960	51	0.350	50	0.873		N O T  P E R T I N E N T
44	53.890	52	0.350	52	0.873		
46	53.820	53	0.350	54	0.873		
48	53.750	54	0.350	56	0.873		
50	53.680	55	0.350	58	0.873		
52	53.610	56	0.350	60	0.873		
54	53.540	57	0.350	62	0.873		
56	53.470	58	0.350	64	0.873		
58	53.410	59	0.350	66	0.873		
60	53.340	60	0.350	68	0.873		
62	53.270	61	0.350	70	0.873		
64	53.200	62	0.350	72	0.873		
66	53.130	63	0.350	74	0.873		
68	53.060	64	0.350	76	0.873		
70	52.990	65	0.350	78	0.873		
72	52.920	66	0.350	80	0.873		
74	52.850	67	0.350	82	0.873		
76	52.780	68	0.350	84	0.873		
78	52.710	69	0.350	86	0.873		
80	52.640	70	0.350	88	0.873		
82	52.570	71	0.350				
84	52.500	72	0.350				
86	52.430	73	0.350				
		74	0.350				
		75	0.350				
		76	0.350				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	65	0.935	65	0.01804	100	0.293
	E	70	1.068	70	0.02041	120	0.297
	A	75	1.216	75	0.02303	140	0.301
	C	80	1.382	80	0.02593	160	0.305
	T	85	1.566	85	0.02912	180	0.310
	S	90	1.771	90	0.03262	200	0.314
		95	1.997	95	0.03646	220	0.318
		100	2.247	100	0.04065	240	0.322
		105	2.523	105	0.04524	260	0.327
		110	2.826	110	0.05023	280	0.331
		115	3.159	115	0.05567	300	0.335
		120	3.524	120	0.06156	320	0.339
		125	3.923	125	0.06795	340	0.344
		130	4.359	130	0.07486	360	0.348
		135	4.835	135	0.08232	380	0.352
		140	5.352	140	0.09037	400	0.356
		145	5.913	145	0.09903	420	0.361
		150	6.523	150	0.10830	440	0.365
		155	7.182	155	0.11830	460	0.369
		160	7.895	160	0.12900	480	0.373
		165	8.665	165	0.14050	500	0.378
		170	9.495	170	0.15270	520	0.382
		175	10.390	175	0.16580	540	0.386
		180	11.350	180	0.17970	560	0.390
						580	0.395
						600	0.399

# 1,2,4-TRIMETHYLBENZENE

TME

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Asymmetrical Trimethylbenzene Pseudocumene Pseudocumol Psicumene		Liquid	Colorless
		Irritant	
Shut off ignition sources and call fire department. Restrict access. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible Water may be ineffective on fire. Wear self contained breathing apparatus and protective clothing. Extinguish with dry chemicals, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID  LIQUID Irritating to skin and eyes and respiratory tract. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, do not induce vomiting.  VAPORS OR MIST Irritating to skin, eyes and respiratory tract. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 32; Aromatic Hydrocarbon  
2.2 **Formula:** C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>3</sub>  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 95-63-6  
2.6 **NAERG Guide No.:** Not listed.  
2.7 **Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self contained breathing apparatus, rubber boots, and heavy rubber gloves.
- 3.2 **Symptoms Following Exposure:** Harmful if inhaled or swallowed. Vapor or mist is irritating to the eyes, mucous membrane and upper respiratory tract. Prolonged contact can cause dermatitis, nausea, headache, dizziness, and narcotic effect.
- 3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Do not induce vomiting. EYES - OR - SKIN: Flush with copious amounts of water for at least 15 minutes while removing contaminated clothing and shoes.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system; if present in high concentrations the sensation is unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 111°F C.C.  
4.2 **Flammable Limits in Air:** LEL = 0.9%; UEL 6.4%  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam, water sprays.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 932°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 57.1 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 15.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Currently not available  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Currently not available  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 0  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 120.20  
9.3 **Boiling Point at 1 atm:** 334.4°F = 168°C = 441.2°K  
9.4 **Freezing Point:** -47.2°F = -44°C = 229.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.889  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 4.2  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.0948 psia

### NOTES

# 1,2,4-TRIMETHYLBENZENE

TME

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	56 100 101 112 123 148 176 193 217 253 294 337	0.019 0.087 0.097 0.135 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.257 0.272 0.286 0.301 0.315 0.329 0.343 0.356 0.369 0.382 0.395 0.408 0.421 0.433 0.445 0.457 0.469 0.481 0.492 0.504 0.515 0.526 0.536 0.547 0.558



# TETRAMETHYL LEAD

TML

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Lead tetramethyl	Oily liquid Colorless Fruity odor
Sinks in water. Poisonous, flammable vapor is produced.	
Evacuate. Keep people away. <b>AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Containers may explode in fire. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from behind barrier or protected location. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $Pb(CH_3)_4$
- 2.3 IMO/UN Designation: 6.1/1649
- 2.4 DOT ID No.: 1649
- 2.5 CAS Registry No.: 75-74-1
- 2.6 NAERG Guide No.: 131
- 2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic vapor canister face mask for short periods, air line mask for longer periods; protective goggles or face shield; neoprene-coated protective gloves; rubber shoes or boots; white or light-colored clothing.
- 3.2 **Symptoms Following Exposure:** Increased urinary output of lead. If inhaled or absorbed by skin, may cause insomnia, excitability, delirium, coma, and death. Do not confuse with inorganic lead.
- 3.3 **Treatment of Exposure:** Remove victim from contaminated area. SKIN: wash with kerosene or similar petroleum distillate, followed by soap and water; consult physician immediately.
- 3.4 **TLV-TWA:** 0.15 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral rat LD<sub>50</sub> = 109 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Lead poisoning
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 40 mg Pb/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 0.075 mg/m<sup>3</sup>
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 100°F O.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic gases are generated in fire.
- 4.6 **Behavior in Fire:** May explode
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 38.1 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Starts to decompose at about 212°F. If confined, may explode or detonate at high temperatures.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 3  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: Yes
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	3
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 267.33
- 9.3 Boiling Point at 1 atm: 230°F = 110°C = 383°K (begins to decompose at 212°F)
- 9.4 Freezing Point: -17.5°F = -27.5°C = 245.7°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.6 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: (est.) 55.5 Btu/lb = 30.8 cal/g = 1.29 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: (est.) -5290 Btu/lb = -2940 cal/g = -123 X 10<sup>5</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# TETRAMETHYL LEAD

TML

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
50	124.500	0	0.179		N	28	0.825
52	124.500	5	0.179		O	30	0.809
54	124.500	10	0.179		T	32	0.793
56	124.500	15	0.179			34	0.778
58	124.500	20	0.179		P	36	0.763
60	124.500	25	0.179		E	38	0.748
62	124.500	30	0.179		R	40	0.734
64	124.500	35	0.179		T	42	0.720
66	124.500	40	0.179		I	44	0.707
68	124.500	45	0.179		N	46	0.694
70	124.500	50	0.179		E	48	0.681
72	124.500	55	0.179		N	50	0.669
74	124.500	60	0.179		T	52	0.657
76	124.500					54	0.645
78	124.500					56	0.634
80	124.500					58	0.623
82	124.500					60	0.612
84	124.500					62	0.601
						64	0.591
						66	0.581
						68	0.571
						70	0.561
						72	0.552
						74	0.543
						76	0.534
						78	0.525

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.050	35	0.149	35	0.00751		C
		40	0.177	40	0.00884		U
		45	0.210	45	0.01036		R
		50	0.248	50	0.01210		R
		55	0.291	55	0.01407		E
		60	0.340	60	0.01630		N
		65	0.397	65	0.01883		T
		70	0.461	70	0.02166		L
		75	0.533	75	0.02484		Y
		80	0.615	80	0.02840		
		85	0.708	85	0.03237		N
		90	0.812	90	0.03677		O
		95	0.928	95	0.04166		T
		100	1.058	100	0.04706		
		105	1.202	105	0.05302		A
		110	1.363	110	0.05958		V
		115	1.541	115	0.06677		A
		120	1.738	120	0.07466		I
		125	1.955	125	0.08327		L
		130	2.194	130	0.09266		A
		135	2.457	135	0.10290		B
							L
							E

# 1-ISOBUTYRATE

TMP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Texanol	Liquid  Colorless  Mild, characteristic  Floats on water.
Shut off ignition sources and call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 34; Esters  
**2.2 Formula:**  
 $(\text{CH}_3)_2\text{CHCHOHC}(\text{CH}_3)_2\text{CH}_2\text{OCOCH}(\text{CH}_3)_2$   
**2.3 IMO/UN Designation:** Currently not available  
**2.4 DOT ID No.:** Not listed.  
**2.5 CAS Registry No.:** 25265-77-4  
**2.6 NAERG Guide No.:** Not listed  
**2.7 Standard Industrial Trade Classification:** 51375

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Where splashing is possible wear full face shield or chemical safety goggles.  
**3.2 Symptoms Following Exposure:** Exposure can cause mild irritation of eyes, nose and throat.  
**3.3 Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water.  
**3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 2; oral rat  $\text{LD}_{50}$  = 3.2 - 6.4 g/kg  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 248°F C.C.  
**4.2 Flammable Limits in Air:** LFL: 0.62% at 300°F; UFL: 4.24% at 393°F.  
**4.3 Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Since material is lighter than water and insoluble, fire could be spread by using water in an uncontained area.  
**4.5 Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Not listed.  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 78.5 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 24.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction.  
**5.2 Reactivity with Common Materials:** Can react vigorously with oxidizing agents.  
**5.3 Stability During Transport:** Stable.  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent.  
**5.5 Polymerization:** Will not polymerize.  
**5.6 Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Technical grades.  
**7.2 Storage Temperature:** Ambient.  
**7.3 Inert Atmosphere:** No requirement.  
**7.4 Venting:** Open.  
**7.5 IMO Pollution Category:** C  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed.  
**8.2 49 CFR Class:** Not pertinent.  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 216.31  
**9.3 Boiling Point at 1 atm:** 471°F = 244°C = 517°K  
**9.4 Freezing Point:** Currently not available  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 0.95 @ 20°C.  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** 7.45  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Not pertinent.  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# 1-ISOBUTYRATE

TMP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	7.930		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	189 356	0.019 2.418	189 356	0.00060 0.05973		C U R R E N T L Y  N O T  A V A I L A B L E

# TANNIC ACID

TNA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chinese tannin Gallotannic acid Gallotannin Glycerite Tannin	Solid  Light yellow to tan  Faint odor  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals or carbon dioxide. Water and foam may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enter water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $C_{76}H_{52}O_{46}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 1401-55-4  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51385

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; protective gloves  
3.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat, coughing, and sneezing. Ingestion may cause gastric disturbance. Contact with eyes causes irritation.  
3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water; induce vomiting. EYES or SKIN: flush with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; oral  $LD_{50} = 2,300$  mg/kg (rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Causes cancer of liver in rats  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not pertinent  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Decomposes at 210° to carbon dioxide and pyrogallol, which can form irritating vapors.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 980°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 314.2 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 102.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 37 ppm/96 hr/mosquitofish/TL<sub>m</sub>/fresh water  
<1.7 mg/1/72 hr/young chinook salmon/critical level/salt water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 38%, 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 84%; Reagent  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 1,701  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: >1 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -9,810 Btu/lb = -5,450 cal/g = 228 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# TANNIC ACID

TNA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	300.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# THALLIUM NITRATE

TNI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Nitric acid, thallium (I) salt Nitric acid, thallous salt Thallium mononitrate Thallium (I) nitrate Thallous nitrate	Solid (crystals)      White      Odorless  Sinks and mixes with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID OR DUST.</b> Wear self-contained positive pressure breathing apparatus and full protective clothing. Notify local health and pollution control agencies.	
<b>Fire</b>	Nonflammable. Poisonous and irritating fumes are produced in a fire or when heated. Wear self-contained positive pressure breathing apparatus and full protective clothing. Small fires: extinguish with dry chemical, CO <sub>2</sub> , water spray, or foam. Large fires: extinguish with water spray, fog, or foam.
<b>Exposure</b>	CALL FOR MEDICAL AID DUST POISONOUS. MAY BE FATAL IF INHALED OR ABSORBED THROUGH SKIN. ONSET OF SYMPTOMS MAY BE DELAYED SEVERAL HOURS. If in eyes or on skin, flush with running water for at least 15 minutes, holding eyelids open periodically, if appropriate. Remove and isolate contaminated clothing and shoes at the site. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS. MAY BE FATAL IF SWALLOWED OR ABSORBED THROUGH SKIN. ONSET OF SYMPTOMS DELAYED 12 TO 24 HOURS AFTER INGESTION. If swallowed, may cause nausea, vomiting, diarrhea, and abdominal pain. IF IN EYES OR ON SKIN: flush with running water for at least 15 minutes, holding eyelids open periodically, if appropriate. Remove and isolate contaminated clothing and shoes at the site. IF SWALLOWED and victim is CONSCIOUS: have victim drink water and induce vomiting by touching finger to back of throat. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: TlNO<sub>3</sub>  
2.3 IMO/UN Designation: 6.1/2727  
2.4 DOT ID No.: 2727  
2.5 CAS Registry No.: 10102-45-1  
2.6 NAERG Guide No.: 141  
2.7 Standard Industrial Trade Classification: 52359

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Wear self-contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Thallium is one of the more toxic elements both as an acute and a chronic poison. Effects of exposure are cumulative and onset of symptoms may be delayed 12 to 24 hours. May be fatal if inhaled, ingested or absorbed through the skin. Irritating to skin and eyes. Readily absorbed through the skin and digestive tract. Ingestion of soluble thallium compounds has caused many deaths. Ingestion of sublethal quantities may cause nausea, vomiting, diarrhea, abdominal pain, and bleeding from the gut accompanied or followed by drooping eyelids, crossed eyes, weakness, numbness, tingling of arms and legs, trembling, tightness and pain in the chest. Loss of hair may occur in two to three weeks. Severe intoxication may cause prostration, rapid heartbeat, convulsions, and psychosis. Some effects may be permanent.
- 3.3 **Treatment of Exposure:** INHALATION: Move victim to fresh air; call emergency medical care. If breathing has stopped, give artificial respiration. EYES OR SKIN: Immediately flush with running water for at least 15 minutes, lifting the upper and lower lids occasionally, if appropriate. Speed in removing material from skin is important. Remove and isolate contaminated clothing and shoes at the site. INGESTION: If conscious, have victim drink large quantities of water and induce vomiting by touching the back of the throat with a finger. If unconscious, or having convulsions, do nothing except keep victim warm.
- 3.4 TLV-TWA: 0.1 mg/m<sup>3</sup> (Tl) (skin)  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 4; LD<sub>50</sub> = 15 mg/kg (mouse)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 **Chronic Toxicity:** Thallous ion causes mutagenic effects (chromosomal aberrations) in animals and plants, and teratogenic effects (detrimental to the sexual behavior, reproductive organs, egg and fetal development, and survival of the chicken). It also causes liver and kidney damage, hair loss and permanent effects such as staggering, visual difficulties, trembling, and mental abnormalities. Chronic oral or cutaneous exposure of mice to thallium caused cancer of the female genital tract.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Causes skin and eye irritation.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 20 mg/m<sup>3</sup> (thallium)  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Small fires: dry chemical, CO<sub>2</sub>, water spray or foam.  
Large fires: water spray, fog or foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Contain toxic thallium fumes.  
4.6 **Behavior in Fire:** Decomposes to produce toxic thallium fumes.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Not pertinent  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 0.03 ppm Tl/atlantic salmon/LD<sub>50</sub> 10 ppm Tl/96 hr/brown shrimp/LC<sub>50</sub>  
6.2 **Waterfowl Toxicity:** Approximate oral mean lethal dose in domestic mallards and wild white geese: 31 mg/kg (dry thallous nitrate).  
16 mg/kg (in solution or coated on grain)  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Plants growing in soils or water with very high thallium content may accumulate sufficient thallium to be toxic to organisms that feed on them. Algae from contaminated water exhibited thallium bioconcentration factor of > 430. Other bioconcentration factors that have been reported include 130 for atlantic salmon mussel and 18 for the edible portion of softshell clams. Thallium is a cumulative poison four times as toxic as arsenious oxide.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.999%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Not listed  
7.4 **Venting:** Not pertinent  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison, B  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: U217  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 266.39  
9.3 Boiling Point at 1 atm: 806°F = 430°C = 703.2°K  
9.4 Freezing Point: 402.8°F = 206°C = 479.2°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 5.556 at 21°C  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: (est.) -393 Btu/lb = -218 cal/g = -9.1 x 10<sup>5</sup> J/kg  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 15.5  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Not pertinent

NOTES

# THALLIUM NITRATE

TNI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	40.300		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# TETRANITROMETHANE

TNM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> NCI-C55947 Tetan TNM	Liquid	Colorless or yellow	Pungent
Sinks in water.			
<b>Keep people away. Avoid contact with vapor or liquid.</b> <b>Evacuate</b> <b>Wear self-contained breathing apparatus and protective clothing and gloves.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control authorities.</b>			
<b>Fire</b>	COMBUSTIBLE. May explode when heated. Emits toxic fumes under fire conditions. Wear self-contained breathing apparatus and protective clothing. Extinguish with water spray, dry chemical, CO <sub>2</sub> , or foam.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be fatal if inhaled or absorbed through the skin. Irritating to the eyes, nose, throat, and lungs. Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID May be fatal if ingested or absorbed through the skin. Effects may be delayed. Causes eye and skin irritation. IF IN EYES: hold eyelids open, flush with running water for at least 15 minutes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF SWALLOWED: DO NOT INDUCE VOMITING. Keep victim quiet and maintain normal body temperature.		
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: C(NO <sub>2</sub> ) <sub>4</sub> 2.3 IMO/UN Designation: 5.1/1510 2.4 DOT ID No.: 1510 2.5 CAS Registry No.: 509-14-8 2.6 NAERG Guide No.: 143 2.7 Standard Industrial Trade Classification: 51140
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Approved respirator, safety goggles, chemical resistant gloves, other protective clothing. 3.2 <b>Symptoms Following Exposure:</b> Irritating to mucous membranes, upper respiratory tract, nose and eyes. Absorption into the body leads to the formation of methemoglobin which may lead to cyanosis. Onset may be delayed 2 to 4 hours or longer. Central nervous system depressant. 3.3 <b>Treatment of Exposure:</b> EYES: Hold eyelids open and flush with running water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes. Flush affected areas with running water for at least 15 minutes. Wash contaminated clothing before reuse. INGESTION: Call a physician. 3.4 TLV-TWA: 0.005 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 Toxicity by Ingestion: Grade 3; LD <sub>50</sub> = 130 mg/kg (rat) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: May cause cyanosis due to formation of methemoglobin. Damage to heart and eyes. 3.10 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations. 3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 3.12 Odor Threshold: Currently not available 3.13 IDLH Value: 4 ppm 3.14 OSHA PEL-TWA: 1 ppm 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: >230°F C.C.
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Water spray, CO<sub>2</sub>, dry chemical, foam.
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Toxic fumes of NO<sub>x</sub>.
- 4.6 Behavior in Fire: May be explosive.
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 4.8 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 5.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Incompatible with finely divided metals, iron and iron salts, copper, brass, zinc, or rubber.
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 98%
- 7.2 Storage Temperature: Refrigerate
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: None
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer
- 8.2 49 CFR Class: 5.1
- 8.3 49 CFR Package Group: I
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 4              |
- 8.6 EPA Reportable Quantity: 10 pounds 10 pounds
- 8.7 EPA Pollution Category: A
- 8.8 RCRA Waste Number: P112
- 8.9 EPA FWPCL List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 196.03
- 9.3 Boiling Point at 1 atm: 259°F = 126°C = 399°K
- 9.4 Freezing Point: 56°F = 13.5°C = 286.7°K
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 1.6380 at 20°C
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: 6.76
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: 188 Btu/lb = 104 cal/g = 4.4 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Currently not available
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: 0.5 psia

## NOTES

# TETRANITROMETHANE

TNM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	102.260		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250	0.226 0.339 0.487 0.676 0.912 1.202 1.551 1.967 2.457 3.027 3.686 4.441 5.299 6.269 7.358 8.575 9.929 11.429		C U R R E N T L Y  N O T  A V A I L A B L E	25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.165 0.170 0.175 0.180 0.184 0.189 0.194 0.199 0.204 0.208 0.213 0.218 0.223 0.228 0.233 0.237 0.242 0.247 0.252 0.257 0.261 0.266 0.271 0.276

# P-TOLUIDINE

TOD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 4-Amino-1-methylbenzene 4-Aminotoluene 4-Methylaniline p-Methylaniline 4-Methylbenzenamine Naphtol as-kg	Solid  Colorless  Sinks and mixes with water.
<b>Keep people away. Avoid contact with liquid. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Water may be ineffective on fire. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam, water, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Skim; Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 4-CH<sub>3</sub>C<sub>6</sub>H<sub>4</sub>NH<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/1708  
2.4 DOT ID No.: 1708  
2.5 CAS Registry No.: 106-49-0  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51454

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles; face shield; approved respirator; leather or rubber safety shoes; butyl rubber gloves
- 3.2 **Symptoms Following Exposure:** Absorption of toxic quantities by any route causes cyanosis (blue discoloration of lips, nails, skin); nausea, vomiting, and coma may follow. Repeated inhalation of low concentrations may cause pallor, low-grade secondary anemia, fatigability, and loss of appetite. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound.  
INHALATION: move to fresh air. INGESTION: if victim is conscious, promptly induce vomiting  
EYES: flush with copious amounts of water for at least 15 min., holding lids apart. SKIN: remove all contaminated clothing; wash affected areas immediately and thoroughly with plenty of warm water and soap.
- 3.4 TLV-TWA: 2 ppm (skin)  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 330 mg/kg (mouse)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Suspected Carcinogen  
3.10 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.  
3.11 Liquid or Solid Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 188°F C.C.  
4.2 Flammable Limits in Air: 1.1 - 6.6%  
4.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Currently not available  
4.5 Special Hazards of Combustion Products: Toxic and flammable vapors may form in fire.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 899°F  
4.8 Electrical Hazards: I, D  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 48.8 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 12.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Will not occur  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 99.5 + %  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Not Listed  
7.4 Venting: Not Listed  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: II  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: U353  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 107.2  
9.3 Boiling Point at 1 atm: 393°F = 200.6°C = 473.6°K  
9.4 Freezing Point: 112.1°F = 44.5°C = 317.7°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 1.0 at 20°C  
9.8 Liquid Surface Tension: 34.6 dyne/cm = .035 N/m at 50°C  
9.9 Liquid Water Interfacial Tension: Not Pertinent  
9.10 Vapor (Gas) Specific Gravity: 3.9  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: -15883 Btu/lb = -8824 cal/g = -369 x 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: 71.8 Btu/lb = 39.9 cal/g = 1.7 x 10<sup>5</sup> J/kg  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Very Low

### NOTES

# P-TOLUIDINE

TOD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	60.030		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	122 124 126 128 130 132 134 136 138 140	1.800 1.773 1.746 1.719 1.692 1.665 1.638 1.611 1.584 1.557

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
70 72 74 76 78 80 82 84 86 88	0.744 0.780 0.816 0.853 0.889 0.925 0.962 0.998 1.035 1.071	120 140 160 180 200 220 240 260 280 300 320 340 360 380	0.029 0.065 0.129 0.236 0.406 0.662 1.035 1.563 2.287 3.260 4.543 6.204 8.322 10.989		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.259 0.270 0.281 0.292 0.304 0.315 0.326 0.338 0.349 0.360 0.371 0.383 0.394 0.405 0.417 0.428 0.439 0.450 0.462 0.473 0.484 0.495 0.507 0.518 0.529

# TALL OIL, FATTY ACID

TOF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Tall oil fatty oil	Liquid Clear amber to yellow Characteristic Floats on water.
Wear full covering clothing, goggles and rubber gloves. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with water spray, dry chemical, alcohol foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. LIQUID Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Mixture.  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed.  
2.5 CAS Registry No.: Not pertinent.  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 59810

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full covering clothing and chemical protective gloves. Where splashing is possible wear full face shield or chemical safety goggles.  
3.2 **Symptoms Following Exposure:** Exposure can cause mild irritation of eyes, nose and throat.  
3.3 **Treatment of Exposure:** Get medical attention. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. INGESTION: Do not induce vomiting. Dilute by drinking water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** >250°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion**  
Products: Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Not pertinent.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Open.  
7.5 **IMO Pollution Category:** (C)  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent.  
9.3 **Boiling Point at 1 atm:** >662°F = >350°C = >623°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.91  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TALL OIL, FATTY ACID

TOF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# M-TOLUIDINE

TOI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 3-Amino-1-methylbenzene 3-Aminotoluene 3-Methylaniline m-Methylaniline 3-Methylbenzenamine	Liquid  May float or sink in water.	Colorless to yellow-brown  	Aniline-like aromatic odor
Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, alcohol or polymer foam or carbon dioxide. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Skim; Pump  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $3\text{-CH}_3\text{C}_6\text{H}_4\text{NH}_2$
- 2.3 IMO/UN Designation: 6.1/1708
- 2.4 DOT ID No.: 1708
- 2.5 CAS Registry No.: 108-44-1
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51454

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Chemical safety goggles; face shield; approved respirator; butyl rubber gloves
- 3.2 **Symptoms Following Exposure:** Absorption of toxic quantities by any route causes cyanosis (blue discoloration of lips, nails, skin); nausea, vomiting, and coma may follow. Repeated inhalation of low concentrations may cause pallor, low-grade secondary anemia, fatigability, and loss of appetite. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound.  
INHALATION: move to fresh air. INGESTION: if victim is conscious, promptly induce vomiting  
EYES: flush with copious amounts of water for at least 15 min., holding lids apart. SKIN: remove all contaminated clothing; wash affected areas immediately and thoroughly with plenty of warm water and soap.
- 3.4 TLV-TWA: 2 ppm (skin)
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50}$  = 450 mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are moderately irritating such that personnel will not tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 186°F C.C.
- 4.2 **Flammable Limits in Air:** 1.1 - 6.6 %
- 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and flammable vapors may form in fire.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** 899°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 48.8 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 12.5 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Will not occur
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 99.5 + %
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 107.2
- 9.3 **Boiling Point at 1 atm:** 398.1°F = 203.4°C = 476.6°K
- 9.4 **Freezing Point:** -22.7°F = -30.4°C = 242.8°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.989 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 36.9 dynes/cm = .037 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 3.9 (est)
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** -15,883 Btu/lb = -8,824 cal/g = -369 x 10<sup>3</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Very Low

### NOTES

# M-TOLUIDINE

TOI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	61.740		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	59 60 61 62 63 64 65 66 67 68	4.420 4.343 4.268 4.196 4.126 4.059 3.994 3.931 3.869 3.810

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	120 140 160 180 200 220 240 260 280 300 320 340 360 380	0.031 0.067 0.130 0.234 0.397 0.639 0.988 1.475 2.137 3.019 4.169 5.647 7.517 9.853		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.259 0.270 0.281 0.292 0.304 0.315 0.326 0.338 0.349 0.360 0.371 0.383 0.394 0.405 0.417 0.428 0.439 0.450 0.462 0.473 0.484 0.495 0.507 0.518 0.529



# TOLUENE

TOL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methylbenzene Methylbenzol Toluol	Watery liquid  Colorless  Pleasant odor  Floats on water. Flammable, irritating vapor is produced.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	<b>FLAMMABLE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing difficult, give oxygen.  <b>LIQUID</b> Irritating to skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. <b>DO NOT INDUCE VOMITING.</b>
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 32; Aromatic Hydrocarbon  
**2.2 Formula:** C<sub>6</sub>H<sub>5</sub>CH<sub>3</sub>  
**2.3 IMO/UN Designation:** 3.2/1294  
**2.4 DOT ID No.:** 1294  
**2.5 CAS Registry No.:** 108-88-3  
**2.6 NAERG Guide No.:** 130  
**2.7 Standard Industrial Trade Classification:** 51123

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Air-supplied mask; goggles or face shield; plastic gloves.  
**3.2 Symptoms Following Exposure:** Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration.  
**3.3 Treatment of Exposure:** INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.  
**3.4 TLV-TWA:** 50 ppm  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Kidney and liver damage may follow ingestion.  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
**3.12 Odor Threshold:** 0.17 ppm  
**3.13 IDLH Value:** 500 ppm  
**3.14 OSHA PEL-TWA:** 200 ppm  
**3.15 OSHA PEL-STEL:** 500 ppm, 10 minute peak once in 8 hour shift  
**3.16 OSHA PEL-Ceiling:** 300 ppm  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 55°F O.C. 40°F C.C.  
**4.2 Flammable Limits in Air:** 1.27%-7%  
**4.3 Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires, ordinary foam for large fires.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
**4.5 Special Hazards of Combustion Products:** Not pertinent  
**4.6 Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
**4.7 Auto Ignition Temperature:** 896°F  
**4.8 Electrical Hazards:** Class I, Group D  
**4.9 Burning Rate:** 5.7 mm/min.  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 11.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 9.5%

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction  
**5.2 Reactivity with Common Materials:** No reaction  
**5.3 Stability During Transport:** Stable  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent  
**5.5 Polymerization:** Not pertinent  
**5.6 Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** 1180 mg/l/96 hr/sunfish/TL<sub>m</sub>/fresh water  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** 0%, 5 days; 38% (theor), 8 days  
**6.4 Food Chain Concentration Potential:** None  
**6.5 GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Research, reagent, nitration-all 99.8 + %; industrial: contains 94 + %, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 90/120: less pure than industrial.  
**7.2 Storage Temperature:** Ambient  
**7.3 Inert Atmosphere:** No requirement  
**7.4 Venting:** Open (flame arrester) or pressure-vacuum  
**7.5 IMO Pollution Category:** C  
**7.6 Ship Type:** 3  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Flammable liquid  
**8.2 49 CFR Class:** 3  
**8.3 49 CFR Package Group:** II  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

**8.6 EPA Reportable Quantity:** 1000 pounds  
**8.7 EPA Pollution Category:** C  
**8.8 RCRA Waste Number:** U220  
**8.9 EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 92.14  
**9.3 Boiling Point at 1 atm:** 231.1°F = 110.6°C = 383.8°K  
**9.4 Freezing Point:** -139°F = -95.0°C = 178.2°K  
**9.5 Critical Temperature:** 605.5°F = 318.6°C = 591.8°K  
**9.6 Critical Pressure:** 596.1 psia = 40.55 atm = 4.108 MN/m<sup>2</sup>  
**9.7 Specific Gravity:** 0.867 at 20°C (liquid)  
**9.8 Liquid Surface Tension:** 29.0 dynes/cm = 0.0290 N/m at 20°C  
**9.9 Liquid Water Interfacial Tension:** 36.1 dynes/cm = 0.0361 N/m at 25°C  
**9.10 Vapor (Gas) Specific Gravity:** Not pertinent  
**9.11 Ratio of Specific Heats of Vapor (Gas):** 1.089  
**9.12 Latent Heat of Vaporization:** 155 Btu/lb = 86.1 cal/g = 3.61 X 10<sup>5</sup> J/kg  
**9.13 Heat of Combustion:** -17,430 Btu/lb = -9686 cal/g = -405.5 X 10<sup>5</sup> J/kg  
**9.14 Heat of Decomposition:** Not pertinent  
**9.15 Heat of Solution:** Not pertinent  
**9.16 Heat of Polymerization:** Not pertinent  
**9.17 Heat of Fusion:** 17.17 cal/g  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** 1.1 psia

### NOTES

# TOLUENE

TOL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-30	57.180	0	0.396	0	1.026	0	1.024
-20	56.870	5	0.397	10	1.015	5	0.978
-10	56.550	10	0.399	20	1.005	10	0.935
0	56.240	15	0.400	30	0.994	15	0.894
10	55.930	20	0.402	40	0.983	20	0.857
20	55.620	25	0.403	50	0.972	25	0.821
30	55.310	30	0.404	60	0.962	30	0.788
40	54.990	35	0.406	70	0.951	35	0.757
50	54.680	40	0.407	80	0.940	40	0.727
60	54.370	45	0.409	90	0.929	45	0.700
70	54.060	50	0.410	100	0.919	50	0.673
80	53.750	55	0.411	110	0.908	55	0.649
90	53.430	60	0.413	120	0.897	60	0.625
100	53.120	65	0.414	130	0.886	65	0.603
110	52.810	70	0.415	140	0.876	70	0.582
120	52.500	75	0.417	150	0.865	75	0.562
		80	0.418	160	0.854	80	0.544
		85	0.420	170	0.843	85	0.526
		90	0.421	180	0.833	90	0.509
		95	0.422	190	0.822	95	0.493
		100	0.424	200	0.811	100	0.477
		105	0.425	210	0.800		
		110	0.427				
		115	0.428				
		120	0.429				
		125	0.431				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.050	0	0.038	0	0.00070	0	0.228
		10	0.057	10	0.00103	25	0.241
		20	0.084	20	0.00150	50	0.255
		30	0.121	30	0.00212	75	0.268
		40	0.172	40	0.00296	100	0.281
		50	0.241	50	0.00405	125	0.294
		60	0.331	60	0.00547	150	0.306
		70	0.449	70	0.00727	175	0.319
		80	0.600	80	0.00954	200	0.331
		90	0.792	90	0.01237	225	0.343
		100	1.033	100	0.01584	250	0.355
		110	1.332	110	0.02007	275	0.367
		120	1.700	120	0.02518	300	0.378
		130	2.148	130	0.03127	325	0.389
		140	2.690	140	0.03850	350	0.400
		150	3.338	150	0.04700	375	0.411
		160	4.109	160	0.05691	400	0.422
		170	5.018	170	0.06840	425	0.432
		180	6.083	180	0.08162	450	0.443
		190	7.323	190	0.09675	475	0.453
		200	8.758	200	0.11400	500	0.462
		210	10.410	210	0.13340	525	0.472
						550	0.482
						575	0.491
						600	0.500

# 2-(2,4,5-TRICHLOROPHENOXY) PROPANOIC ACID

TPA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Fenoprop Kurosalg Silvex 2,4,5-TP		Solid, powder      White  Sinks and mixes slowly with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable. Poisonous gases may be produced in fire. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).	
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR DUST Harmful if swallowed or inhaled. Irritating to skin and eyes. Move to fresh air. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep warm.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: (C <sub>8</sub> H <sub>3</sub> Cl <sub>3</sub> )OCH(CH <sub>3</sub> )COOH 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51377
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus, rubber gloves, hats, suits and boots, and goggles. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Irritating to nose and throat. May cause nausea, vomiting, lethargy and incoordination. May cause kidney and liver damage. EYES: Irritation. May cause corneal injury or burn. SKIN: Irritation. 3.3 <b>Treatment of Exposure:</b> Call a doctor. INHALATION: Remove from exposure. EYES: Flush with water for 15 minutes. SKIN: Wash with soap and water. INGESTION: Induce vomiting. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5 to 5 g/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> A decrease in fetal weight and cleft palates were observed in laboratory mice. Possible liver and kidney damage. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Not pertinent 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard. If powder remains on skin, may cause smarting and reddening of skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Water fog, foam, CO<sub>2</sub> or dry chemical.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Hydrogen chloride may be liberated.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.35 ppm/96-hour/Mosquito fish/TL<sub>50</sub>/static  
1 to 5 ppm lethal to newly hatched bluegill fry  
2.4 ppm/48-hour/bluegill/TL<sub>50</sub>.  
6.2 **Waterfowl Toxicity:** 2000 mg/kg LD<sub>50</sub>.  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 59 to 65% emulsifiable concentration 10.4% amine salt solution 98%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 269.51.  
9.3 **Boiling Point at 1 atm:** >300°F at 0.5.  
9.4 **Freezing Point:** 358.9°F = 181.6°C = 454.75°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.2085 at 20°C.  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 9.29  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# 2-(2,4,5-TRICHLOROPHENOXY) PROPANOIC ACID

TPA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T		NOT P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T Y  S O L U B L E		NOT P E R T I N E N T		NOT P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# ISOOCTYL ESTER

TPE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Silvex, isooctyl ester 2,4,5-TP acid esters	Oily liquid                      Amber to dark brown  Sinks in water.
Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	COMBUSTIBLE. Poisonous gases may be produced in fire. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Harmful if swallowed. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $C_{17}H_{34}ClO_2$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves and boots, safety goggles or face mask, protective clothing and a NIOSH approved respirator.
- 3.2 **Symptoms Following Exposure:** INHALATION: Vapors or mists may be irritating to nose and throat. EYES: Mild irritation. SKIN: Irritation-slight to moderate. INGESTION: Weakness, lethargy, anorexia, diarrhea, spasticity, possible death due to ventricular fibrillation and subsequent cardiac arrest.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove victim to fresh air, if needed administer artificial respiration. EYES: Flush with plenty of water for at least 15 minutes. SKIN: Wash with soap and water. Remove contaminated clothing and shoes. INGESTION: Induce vomiting and administer gastric lavage.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5$  to 5 g/kg.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Possible teratogen. The contaminant Dioxin is, at least partially the cause of the defects.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 405°F O.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water fog, foam,  $CO_2$  or dry chemical
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Emits noxious fumes, including chloride.
- 4.6 **Behavior in Fire:** May liberate hydrogen chloride.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 97.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 30.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Oxidizing material.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Will not occur.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
 0.56 ppm/48-hour/Bluegill  
 sunfish/LC<sub>50</sub>/est., based on 2,4,5-T  
 1.3 ppm/48-hour/Rainbow trout/LC<sub>50</sub>/est., based on 2,4,5-T
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 95 to 97%.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 381.7259 (calculated).
- 9.3 **Boiling Point at 1 atm:** 320°F = 160°C = 433.2°K
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.183 at 20°C.
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Currently not available
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ISOOCTYL ESTER

TPE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# THIOPHOSGENE

TPG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Thiocarbonyl chloride	Liquid	Red	Sharp choking odor
Sinks in water. Reacts slowly with water and produces poisonous vapor.			
Evacuate. KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR. Wear goggles and self-contained breathing apparatus. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration (but not mouth-to-mouth). If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump  
Chemical and Physical Treatment:  
Neutralize  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: CSCl<sub>2</sub>  
2.3 IMO/UN Designation: 6.1/2474  
2.4 DOT ID No.: 2474  
2.5 CAS Registry No.: 463-71-8  
2.6 NAERG Guide No.: 157  
2.7 Standard Industrial Trade Classification: 51549

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus or organic canister mask; goggles or face shield; rubber gloves
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of respiratory system and delayed pulmonary edema. Vapor irritates eyes. Liquid burns skin and eyes. Ingestion causes irritation of mouth and stomach.
- 3.3 **Treatment of Exposure:** Get medical attention at once after any exposure to this compound.  
INHALATION: remove victim from exposure; support respiration; watch for pulmonary edema.  
EYES: irrigate with large quantities of water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; give large amount of water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 929 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, foam
- 4.5 **Special Hazards of Combustion Products:** Toxic phosgene, hydrogen chloride, and sulfur dioxide may be generated in a fire.
- 4.6 **Behavior in Fire:** Decomposes above 200°C to carbon bisulfide (very flammable) and carbon tetrachloride.
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 9.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 3.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Evolves hydrogen chloride, carbon disulfide, and carbon dioxide. Reaction is slow unless water is hot.
- 5.2 **Reactivity with Common Materials:**  
Corrodes metals in presence of moisture.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: I  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 1              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 115.0
- 9.3 **Boiling Point at 1 atm:** 163°F = 73°C = 346°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.513 at 20°C
- 9.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 4
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** (est.) 128 Btu/lb = 71 cal/g = 3.0 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** (est.) -3,400 Btu/lb = -1,900 cal/g = -80 X 10<sup>6</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# THIOPHOSGENE

TPG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	95.440	N O T  P E R T I N E N T	N O T  P E R T I N E N T	51	0.887	N O T  P E R T I N E N T	N O T  P E R T I N E N T
36	95.370			52	0.887		
38	95.299			53	0.887		
40	95.230			54	0.887		
42	95.160			55	0.887		
44	95.089			56	0.887		
46	95.020			57	0.887		
48	94.950			58	0.887		
50	94.879			59	0.887		
52	94.809			60	0.887		
54	94.740			61	0.887		
56	94.669			62	0.887		
58	94.599			63	0.887		
60	94.530			64	0.887		
62	94.469			65	0.887		
64	94.400			66	0.887		
66	94.330			67	0.887		
68	94.259			68	0.887		
70	94.190			69	0.887		
72	94.120			70	0.887		
74	94.049			71	0.887		
76	93.980			72	0.887		
				73	0.887		
				74	0.887		
				75	0.887		
				76	0.887		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
R E A C T I V E		124	6.618	124	0.12150	100	0.138
		126	6.909	126	0.12640	120	0.139
		128	7.211	128	0.13150	140	0.139
		130	7.524	130	0.13670	160	0.140
		132	7.849	132	0.14210	180	0.141
		134	8.185	134	0.14770	200	0.142
		136	8.533	136	0.15350	220	0.143
		138	8.893	138	0.15940	240	0.144
		140	9.266	140	0.16550	260	0.145
		142	9.652	142	0.17190	280	0.146
		144	10.050	144	0.17840	300	0.147
		146	10.460	146	0.18510	320	0.148
		148	10.890	148	0.19200	340	0.148
		150	11.330	150	0.19920	360	0.149
		152	11.790	152	0.20650	380	0.150
		154	12.260	154	0.21410	400	0.151
		156	12.750	156	0.22180	420	0.152
		158	13.250	158	0.22990	440	0.153
		160	13.770	160	0.23810		
		162	14.310	162	0.24660		
		164	14.860	164	0.25530		
		166	15.430	166	0.26430		
		168	16.020	168	0.27350		
		170	16.630	170	0.28300		
		172	17.260	172	0.29270		
		174	17.910	174	0.30270		



# TRICHLOROPHENOL

TPH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dowicide 2 Omial Phenachlor 2,4,5-Trichlorophenol	Solid crystals or flakes  Sinks in water.	Yellow  	Strong disinfectant odor
Avoid contact with solid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST OR SOLID Irritating to eyes, nose, and throat. Move to fresh air. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{HOC}_6\text{H}_3\text{Cl}_3$ -2, 4, 5
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2020
- 2.5 CAS Registry No.: 95-95-4
- 2.6 NAERG Guide No.: 153
- 2.7 Standard Industrial Trade Classification: 51244

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved dust respirator for toxic dusts; goggles; protective clothing to prevent contact with skin.
- 3.2 **Symptoms Following Exposure:** Dust may cause swelling of eyes and eye injury, irritation of nose and throat. Solid irritates skin on prolonged contact.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; get medical attention. EYES: flush with water for at least 15 min; get medical attention. SKIN: wash with soap and water; if irritation occurs, get medical attention.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** 20% solution in fuel oil: Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Essentially non-volatile at ordinary temperatures.
- 3.11 **Liquid or Solid Characteristics:** May cause injury to eye. Prolonged contact with skin causes a slight burn. Dust irritates nose and throat.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
None
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
3.2 ppm/24 hr/fish/ $\text{TL}_{m}$ /fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical: 95%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food
- 8.2 49 CFR Class: 6.1
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 10 pounds
- 8.7 EPA Pollution Category: A
- 8.8 RCRA Waste Number: U230
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 197.5
- 9.3 Boiling Point at 1 atm: 485°F = 252°C = 525°K
- 9.4 Freezing Point: 135°F = 57°C = 330°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.7 at 25°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas):  
Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# TRICHLOROPHENOL

TPH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.100		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# TRIETHYL PHOSPHITE

TPI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Phosphorous acid, triethyl ester UN 2323 (DOT)	Liquid	Colorless	Odorless
<b>Keep people away. Avoid contact with liquid and vapor. Wear self-contained breathing apparatus and protective clothing. Shut off ignition sources and call fire department. Notify local health and pollution control agencies.</b>			
<b>Fire</b>	Combustible Water may be ineffective on fire. Extinguish with dry chemical, foam, or CO <sub>2</sub> . Cool exposed container with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR OR MIST Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Harmful if absorbed through the skin or swallowed. Remove contaminated clothing. Flush affected areas with soap and plenty of water. IF IN EYES, hold eyelids open and flush with water for 15 minutes. IF SWALLOWED and victim is CONSCIOUS, have victim drink 1-2 glasses of water or milk and induce vomiting.		
<b>Water Pollution</b>	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters
- 2.2 Formula: (C<sub>2</sub>H<sub>5</sub>O)<sub>3</sub>P
- 2.3 IMO/UN Designation: 3.3/2323
- 2.4 DOT ID No.: 2323
- 2.5 CAS Registry No.: 122-52-1
- 2.6 NAERG Guide No.: 129
- 2.7 Standard Industrial Trade Classification: 51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber gloves and rubber boots.
- 3.2 **Symptoms Following Exposure:** Exposure to high concentrations may cause headache, nausea, and dizziness due to reduced cholinesterase activity.
- 3.3 **Treatment of Exposure:** INHALATION: CALL FOR MEDICAL ASSISTANCE. Remove to fresh air. Treat symptomatically. If not breathing, give artificial respiration. INGESTION: If swallowed and victim is conscious, have victim drink 1-2 glasses of milk or water and induce vomiting. If unconscious, do nothing except keep victim warm. EYES: Flush with water for 15 minutes. SKIN: Flush affected area with soap and plenty of water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 3.2 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Prolonged exposures may cause chemical pneumonitis.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 115°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water spray, dry chemical, carbon dioxide, foam.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** May form hazardous decomposition products.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 45.2 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** No reaction.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Cautics:** No reaction.
- 5.5 **Polymerization:** Will not occur.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: (3)
  - Human Oral hazard: 1
  - Human Contact hazard: I
  - Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Approx. 100%
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid.
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	1
- 8.6 **EPA Reportable Quantity:** Not listed
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 166.16
- 9.3 **Boiling Point at 1 atm:** 311°F = 155°C = 428.2°K
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 0.969
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 5.73
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRIETHYL PHOSPHITE

TPI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S L I G H T L Y  S O L U B L E	68	0.019		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# TRIS(AZIRIDINYL)PHOSPHINE OXIDE

TPO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> APO Tris(1-Aziridinyl) phosphine oxide Phosphoric acid triethylenimine Triethylenephosphoramidate		Solid  White  Mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.	
<b>Exposure</b>	Call for medical aid.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: (CH<sub>2</sub>CHN)<sub>3</sub>PO or C<sub>6</sub>H<sub>12</sub>N<sub>3</sub>PO
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2501
- 2.5 CAS Registry No.: 545-55-1
- 2.6 NAERG Guide No.: 152
- 2.7 Standard Industrial Trade Classification: 51479

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective clothing and gloves to prevent contact with skin; goggles.
- 3.2 **Symptoms Following Exposure:** Inhalation (unlikely unless a heavy mist is formed) causes symptoms similar to those observed after ingestion. Contact with liquid or powder causes irritation of eyes and (on prolonged contact) irritation and burns of skin. Burns are slow to develop and slow to heal. May sensitize on repeated contact. Ingestion causes depression, anorexia, and diarrhea, appearing 2-3 days before death, followed by terminal dyspnea, incoordination, epistaxis, salivation, prostration and cyanosis.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. EYES: flush with water at once for at least 15 min.; get medical attention. SKIN: flush with water at once, followed by vinegar and dilute hydrogen peroxide. INGESTION: only symptomatic and supportive measures are available.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 4; oral rat LD<sub>50</sub> = 37 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None observed
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion**  
Products: Phosphoric acid mist may form in fire. Toxic oxides of nitrogen may form.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction, unless in presence of acids or strong caustics
- 5.2 **Reactivity with Common Materials:** Slow decomposition, not considered hazardous
- 5.3 **Stability During Transport:** Stable if cool
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Violent polymerization occurs at about 255°F. Acid fumes also cause polymerization at ordinary temperatures.
- 5.6 **Inhibitor of Polymerization:** None used

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** 8.5-13 mg/kg LD<sub>50</sub>
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 85% solution in acetone-methylene chloride
- 7.2 **Storage Temperature:** Below 100°F
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 173.16
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** 106°F = 41°C = 314°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** (est.) >1 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRIS(AZIRIDINYL)PHOSPHINE OXIDE

TPO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# TRIMETHYL PHOSPHITE

TPP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methyl phosphite Phosphorous acid TMP Trimethyl ester	Liquid	Colorless	Pungent, pyridine-like odor
Avoid contact with liquid and vapors. Stay upwind; keep out of low areas. Wear self-contained positive pressure breathing apparatus and full protective clothing. Shut off ignition sources and call fire department. Use water spray to reduce vapors. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	COMBUSTIBLE. May be ignited by heat, sparks or flames. Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire. Runoff to sewer may create fire or explosion hazard. Move container from fire area if you can do it without risk. Cool containers that are exposed to flames with water from the side. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR May be poisonous if inhaled. Vapors may cause dizziness or suffocation. Fire may produce irritating or poisonous gases. Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Extremely destructive to upper respiratory tract, eyes, and skin. Harmful if absorbed through skin and eyes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. IF IN EYES: immediately flush eyes with running water for at least 15 minutes. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk. DO NOT INDUCE VOMITING. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.		
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are not known. May be harmful if it enters water intakes. Notify local health and wildlife officials. Notify operators of local water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 34; Esters  
2.2 Formula: (CH<sub>3</sub>O)<sub>3</sub>P  
2.3 IMO/UN Designation: 3.3/2329  
2.4 DOT ID No.: 2329  
2.5 CAS Registry No.: 121-45-9  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, safety goggles, rubber gloves, full protective clothing.
- 3.2 **Symptoms Following Exposure:** Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.
- 3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Hold eyelids open and flush with running water for at least 15 minutes. SKIN: Remove contaminated clothing and shoes, flush affected areas with plenty of water.
- 3.4 **TLV-TWA:** 2 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 1.6 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Hydrolyzes to dimethyl hydrogen phosphite, a known animal carcinogen.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of the eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.
- 3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 130°F O.C. 82°F C.C.
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Water, foam, fog, CO<sub>2</sub>
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic fumes of PO<sub>x</sub>
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 34.5 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99+%
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Store under nitrogen
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable Liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 0              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 124.08
- 9.3 **Boiling Point at 1 atm:** 232°F = 111°C = 384°K
- 9.4 **Freezing Point:** -108°F = -78°C = 195°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.046 at 20°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 4.3
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRIMETHYL PHOSPHITE

TPP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	65.670		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# TRIETHYL PHOSPHATE

TPS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethyl phosphate Phosphoric acid, triethyl ester TEP	Liquid	Colorless
<b>Keep people away. Avoid contact with liquid and vapor. Wear self contained breathing apparatus and protective clothing. Call fire department. Notify local health and pollution control agencies.</b>		
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> . Cool exposed containers with water.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR OR MIST May cause irritation. Move to fresh air. If breathing has stopped give artificial respiration. If breathing is difficult give oxygen.  LIQUID May cause irritation. May be harmful if swallowed. Remove contaminated clothing. Flush affected areas with soap and plenty of water for 15 minutes. If in eyes hold eyelids open and flush with plenty of water for 15 minutes.	
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Contain Collection Systems: Skim Chemical and Physical Treatment: Burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 34; Esters 2.2 Formula: (C <sub>2</sub> H <sub>5</sub> O) <sub>3</sub> PO 2.3 IMO/UN Designation: Currently not available 2.4 DOT ID No.: 2783 2.5 CAS Registry No.: 78-40-0 2.6 NAERG Guide No.: 152 2.7 Standard Industrial Trade Classification: 51631
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Protective gloves, safety glasses, rubber gloves & rubber boots. 3.2 <b>Symptoms Following Exposure:</b> May be harmful by inhalation, ingestion or absorption. May cause irritation. 3.3 <b>Treatment of Exposure:</b> INHALATION: Call for medical help. Low hazard. Move to fresh air. If breathing has stopped give artificial respiration. If breathing is difficult, give oxygen. SKIN: Low hazard. Flush with soap and plenty of water. EYES: Immediately flush eyes with plenty of water for 15 minutes. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 1.6 g/kg (mouse) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> In male rats, oral administration of TD <sub>01</sub> 12.6 g/kg for 63 days adversely affected reproductive organs and in female rats, oral administration of TD <sub>01</sub> 5.7 g/kg for 92 days before mating and 1-22 days during gestation adversely affected live birth index. Mutagenic in D. melanogaster at oral dose of 10 mmole/L. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors are non-irritating to eyes and throat. 3.11 <b>Liquid or Solid Characteristics:</b> No appreciable hazard. Practically harmless to skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 240°F C.C.  
4.2 **Flammable Limits in Air:** 1.7 - 10%  
4.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Ordinary foam and water may cause frothing.  
4.5 **Special Hazards of Combustion Products:** May produce hazardous decomposition products such as carbon dioxide, carbon monoxide and oxides of phosphorus.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 845°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 42.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Slight decomposition  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Will not occur  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Approx. 100%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** Data not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison B  
8.2 49 CFR Class: 6  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	1

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 182.16  
9.3 **Boiling Point at 1 atm:** 408°F = 209°C = 482.2°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.068  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 6.28  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.01648 psia

## NOTES

# TRIETHYL PHOSPHATE

TPS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E	68 104 154 180 208 240 259 287 327 369 412	0.005 0.019 0.097 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696	68	6.28000		C U R R E N T L Y  N O T  A V A I L A B L E

# TURPENTINE

TPT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> D.D. turpentine Gum turpentine Spirit of turpentine Sulfate turpentine Turps Wood turpentine	Watery liquid      Colorless      Penetrating, unpleasant odor
Floats on water. Irritating vapor is produced.	
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula: C<sub>10</sub>H<sub>16</sub>  
2.3 IMO/UN Designation: 3.3/1299  
2.4 DOT ID No.: 1299  
2.5 CAS Registry No.: 8006-64-2  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister or air-supplied mask; goggles or face shield; rubber gloves.
- 3.2 **Symptoms Following Exposure:** Vapors cause headache, confusion, respiratory distress. Liquid irritates skin. If ingested, can irritate the entire digestive system and may injure kidneys. If liquid is taken into lungs, causes severe pneumonitis.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; call a doctor; administer artificial respiration and oxygen if required. INGESTION: give water and induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
- 3.4 TLV-TWA: 100 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: 800 ppm
- 3.14 OSHA PEL-TWA: 100 ppm
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 95°F C.C.
- 4.2 **Flammable Limits in Air:** 0.8% (LEL)
- 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Forms heavy black smoke and soot
- 4.7 **Auto Ignition Temperature:** 488°F
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** 2.4 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 66.6 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 18.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
100 ppm\*/fish/toxic/fresh water  
\*Time period not specified.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** A wide variety of grades and purities are shipped. All have about the same hazardous properties.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open (flame arrester)
- 7.5 **IMO Pollution Category:** B
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** Yes
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:** 302–320°F = 150–160°C = 423–433°K
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 0.86 at 15°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** 14 dynes/cm = 0.014 N/m at 22.7°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 0.26 psia

### NOTES

# TURPENTINE

TPT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
32	53.680	28	0.411	32	1.040	46	1.838
34	53.680	30	0.411	34	1.040	48	1.802
36	53.680	32	0.411	36	1.040	50	1.767
38	53.680	34	0.411	38	1.040	52	1.733
40	53.680	36	0.411	40	1.040	54	1.700
42	53.680	38	0.411	42	1.040	56	1.668
44	53.680	40	0.411	44	1.040	58	1.636
46	53.680	42	0.411	46	1.040	60	1.606
48	53.680	44	0.411	48	1.040	62	1.576
50	53.680	46	0.411	50	1.040	64	1.547
52	53.680	48	0.411	52	1.040	66	1.519
54	53.680	50	0.411	54	1.040	68	1.491
56	53.680	52	0.411	56	1.040	70	1.464
58	53.680	54	0.411	58	1.040	72	1.438
60	53.680	56	0.411	60	1.040	74	1.413
62	53.680	58	0.411	62	1.040	76	1.388
64	53.680	60	0.411	64	1.040	78	1.364
66	53.680	62	0.411	66	1.040	80	1.340
		64	0.411			82	1.317
		66	0.411			84	1.294
						86	1.272
						88	1.251
						90	1.230
						92	1.210
						94	1.190
						96	1.170

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	55	0.525		N		N
	N	60	0.561		O		O
	S	65	0.597		T		T
	O	70	0.636				
	L	75	0.676		P		P
	U	80	0.718		E		E
	B	85	0.761		R		R
	L	90	0.807		T		T
	E	95	0.854		I		I
		100	0.903		N		N
		105	0.954		E		E
		110	1.007		N		N
		115	1.061		T		T
		120	1.118				
		125	1.177				
		130	1.237				

# TRIDECYLBENZENE

TRB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Phenyltridecane		Liquid	Colorless
Keep people away. Call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Water may be ineffective on fire. Wear self-contained breathing apparatus and protective clothing. Extinguish with dry chemicals, alcohol foam or CO <sub>2</sub> .		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 32; Aromatic hydrocarbons  
**2.2 Formula:** C<sub>14</sub>H<sub>28</sub>(CH<sub>2</sub>)<sub>12</sub>CH<sub>3</sub>  
**2.3 IMO/UN Designation:** Currently not available  
**2.4 DOT ID No.:** Not listed  
**2.5 CAS Registry No.:** 123-02-4  
**2.6 NAERG Guide No.:** Not listed  
**2.7 Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots, and heavy rubber gloves.  
**3.2 Symptoms Following Exposure:** May be harmful by inhalation, ingestion, or skin absorption. May cause irritation.  
**3.3 Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush eyes with copious amounts of water for at least 15 minutes. SKIN: Wash with soap and copious amounts of water.  
**3.4 TLV-TWA:** Not listed.  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Currently not available  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** >230°F C.C.  
**4.2 Flammable Limits in Air:** Currently not available  
**4.3 Fire Extinguishing Agents:** Water spray, carbon dioxide, dry chemical, alcohol foam.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Currently not available  
**4.5 Special Hazards of Combustion Products:** Currently not available  
**4.6 Behavior in Fire:** Currently not available  
**4.7 Auto Ignition Temperature:** Currently not available  
**4.8 Electrical Hazards:** Currently not available  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 128.5 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 35.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction.  
**5.2 Reactivity with Common Materials:** No reaction.  
**5.3 Stability During Transport:** Stable.  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent.  
**5.5 Polymerization:** Will not occur.  
**5.6 Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: 0  
 Human Oral hazard: -  
 Human Contact hazard: -  
 Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 99%  
**7.2 Storage Temperature:** Ambient.  
**7.3 Inert Atmosphere:** Currently not available  
**7.4 Venting:** Currently not available  
**7.5 IMO Pollution Category:** D  
**7.6 Ship Type:** Data not available  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed.  
**8.2 49 CFR Class:** Not pertinent.  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:** Not listed  
**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 260.47  
**9.3 Boiling Point at 1 atm:** 654.8°F = 346°C = 619.2°K  
**9.4 Freezing Point:** 50°F = 10°C = 283.2°K  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 0.881  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** 8.98  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# TRIDECYL BENZENE

TRB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.316 0.331 0.346 0.361 0.375 0.389 0.403 0.416 0.430 0.443 0.456 0.468 0.480 0.493 0.504 0.516 0.528 0.539 0.550 0.560 0.571 0.581 0.591 0.601 0.611

# TRICHLORFON

TRC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Anthon Bayer 13/59 Chlorophos Dipterex Dylox	Solid crystals      White      Ethyl ether  Sinks and mixes with water.
Keep people away. AVOID CONTACT WITH SOLID AND DUST. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: C<sub>4</sub>H<sub>6</sub>Cl<sub>3</sub>O<sub>4</sub>P  
2.3 IMO/UN Designation: 6.1/2783 (>5%);  
9/2783 (<5%)  
2.4 DOT ID No.: 2783  
2.5 CAS Registry No.: 52-68-6  
2.6 NAERG Guide No.: 152  
2.7 Standard Industrial Trade Classification:  
51631

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Safety glasses, all-purpose canister mask, sleeve-closed gown, gloves and long boots.
- 3.2 **Symptoms Following Exposure:** INHALATION, INGESTION, AND SKIN ABSORPTION. Inhibits cholinesterase. Headache, depressed appetite, nausea, miosis are symptoms of light exposures. Moderate effects are peritoneal paralysis, diarrhea, salivation, lacrimation, sweating, dyspnea, substernal tightness, slow pulse, tremors, muscular cramps and ataxia. Severe symptoms are: pyrexia, cyanosis, pulmonary edema, areflexia, loss of sphincter control, paralysis, coma, heart block, shock and respiratory failure. EYES: Increases permeability of blood vessels in anterior eye. Reduces corneal sensitivity with glaucoma, abnormalities in intraocular tension or decreased visual acuity.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Artificial respiration and oxygen if required. In the presence of symptoms give atropine sulfate, 2 to 4 mg at 5- to 10-minute intervals until signs of atropinization appear. EYES: Flush with copious quantities of water. SKIN: Wash with copious amounts of water and soap. INGESTION: Gastric lavage with tap water or emesis induced by syrup of ipecac followed by saline catharsis. If symptoms occur use treatment as indicated above.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg.  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Mutagenic, teratogenic, carcinogenic, hepatotoxic and hematotoxic.  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Currently not available  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 10.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Currently not available  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Currently not available  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
96-hour TL<sub>m</sub>-Bluegill (soft water) = 3.8 ppm  
96-hour TL<sub>m</sub> Fathead Minnows (Hard H<sub>2</sub>O) = 0.051 ppm  
96-hour TL<sub>m</sub> Fathead Minnows (Soft H<sub>2</sub>O) = 180 ppm  
96-hour TL<sub>m</sub> Striped bass fingerlings = 5.2 ppm  
6.2 **Waterfowl Toxicity:** Young mallard LC<sub>50</sub> = >5000 ppm  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 1% dry bait 50% wettable powder 5% dusts and granules  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Keep Away From Food  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: 100 pounds  
8.7 EPA Pollution Category: B  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 257.45  
9.3 Boiling Point at 1 atm: 212°F = 100°C = 373.2°K  
9.4 Freezing Point: 183.2°F = 84°C = 357.2°K  
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: 1.73 at 20°C  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Currently not available  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Currently not available  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# TRICHLORFON

TRC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	13.000	212	0.002	212	0.00007		C U R R E N T L Y  N O T  A V A I L A B L E



# TRIDECANE

TRD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Tridecane	Liquid                      Colorless  Insoluble; floats on water.
Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Water may be ineffective on fire. Wear self-contained breathing apparatus and protective clothing. Extinguish with dry chemical, foam or CO <sub>2</sub> . Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shorelines. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn;  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 31; Paraffins  
2.2 Formula: CH<sub>3</sub>(CH<sub>2</sub>)<sub>11</sub>CH<sub>3</sub>  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 629-50-5  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51114

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus, rubber boots, and heavy rubber gloves.  
3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion or skin absorption. Vapor or mist is irritating to the eyes, mucous membrane and upper respiratory tract. Causes skin irritation.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. SKIN: Flush with water. EYES: Flush with copious amounts of water for at least 15 minutes.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 175°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 95.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 27.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Will not occur  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0B0  
Damage to living resources: -  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities:

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 184.37  
9.3 **Boiling Point at 1 atm:** 453.2°F = 234°C = 507.2°K  
9.4 **Freezing Point:** 23-24.8°F = -5 to -4°C = 268.2-269.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.756  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 6.4  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** <0.01 psia

### NOTES

# TRIDECANE

TRD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E	139 209 219 248 280 299 325 365 409 453	0.019 0.097 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.365 0.381 0.396 0.411 0.426 0.440 0.455 0.469 0.482 0.496 0.509 0.522 0.535 0.548 0.560 0.572 0.584 0.596 0.607 0.619 0.630 0.641 0.651 0.662 0.672

# TRIPROPYLAMINE

TRL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Tri-n-propylamine	Liquid	Water white	Amine odor
<b>Shut off ignition sources and call fire department.</b> Evacuate. Restrict access. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID. Toxic by inhalation or ingestion.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** (CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>)<sub>3</sub>N  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** 2260  
2.5 **CAS Registry No.:** 102-69-2  
2.6 **NAERG Guide No.:** 132  
2.7 **Standard Industrial Trade Classification:** 51450

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat. Toxic by inhalation or ingestion.
- 3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; oral rat LD<sub>50</sub> = 72 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 105°F C.C.  
4.2 **Flammable Limits in Air:** 0.7%-5.6%  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as nitrogen oxides and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 356°F  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 72.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 20.5 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%; technical.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable Liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 143.31  
9.3 **Boiling Point at 1 atm:** 302 - 312.8°F = 150 - 156°C = 423 - 429°K  
9.4 **Freezing Point:** -137.2°F = -94°C = 179°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.754 @ 20°F  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRIPROPYLAMINE

TRL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	6.290		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	68	0.056	68	0.00142		C U R R E N T L Y  N O T  A V A I L A B L E

# THORIUM NITRATE

TRN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Thorium nitrate tetrahydrate	Solid	White	Odorless
Mixes with water.			
Evacuate. Keep people away. Avoid contact with solid and dust. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Flood discharge area with water.		
<b>Exposure</b>	Call for medical aid. DUST Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{Th}(\text{NO}_3)_4 \cdot 4\text{H}_2\text{O}$  (approx.)
- 2.3 IMO/UN Designation: 7/9171
- 2.4 DOT ID No.: 2976
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: 162
- 2.7 Standard Industrial Trade Classification: 52591

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; gloves; rubber shoes or boots
- 3.2 **Symptoms Following Exposure:** Compound has low chemical toxicity, but alpha emission is expected to constitute a hazard if a fairly large amount is inhaled or ingested. Dust may irritate eyes and cause diffuse dermatitis. Beta and gamma emission is small.
- 3.3 **Treatment of Exposure:** EYES: flush with water until solid is removed. SKIN: wash thoroughly with soap and water. INGESTION: get medical attention.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Genetic effects of long exposure to low level radiation are suspected to be harmful.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable, but may cause fire on contact with ordinary combustibles
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Yields toxic gaseous oxides of nitrogen when involved in fire
- 4.6 **Behavior in Fire:** When large quantities are involved in fire, nitrate may fuse or melt, in which condition application of water may result in extensive scattering of molten material. Will increase the intensity of a fire.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Forms a weak solution of nitric acid; the reaction is not hazardous.
- 5.2 **Reactivity with Common Materials:** In contact with easily oxidizable substances, may react rapidly enough to cause ignition, violent combustion, or explosion. Solutions in water are acidic and can corrode metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1,000 ppm/48 hr/water flea/not toxic/fresh water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Radioactive material
- 8.2 **49 CFR Class:** 7
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	0
Instability (Yellow).....	0
Special (White).....	OX
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 555.2
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity: (est.)** >1 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# THORIUM NITRATE

TRN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# TRIXYLENYL PHOSPHATE

TRP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Coalite NTP Dimethylphenol phosphate (3:1) Reofos 95 Tridimethylphenyl phosphate Trixylyl phosphate Xylenol, phosphate (3:1) Xylyl phosphate	Liquid  Slightly colored  Slight odor  Insoluble in water; sinks.
Call fire department. Avoid contact with liquid and vapor. Notify local Health and Pollution Control Agencies.	
<b>Fire</b>	Combustible. Toxic acidic vapors may form. Extinguish with water fog, alcohol foam, CO <sub>2</sub> or dry chemicals. Wear full protective clothing and self-contained breathing apparatus. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and induce vomiting. Remove clothing and wash skin with soap and water.
<b>Water Pollution</b>	Harmful to aquatic life. May be dangerous if it enters water intakes. Notify local health and wildlife officials Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 34; Esters  
2.2 Formula: C<sub>24</sub>H<sub>27</sub>O<sub>4</sub>P  
2.3 IMO/UN Designation: Currently not available  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 25155-23-1  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51639

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self contained breathing apparatus.  
3.2 **Symptoms Following Exposure:** Breathing or swallowing large quantities may cause ataxia. May irritate skin, respiratory tract, mucous membrane, and eyes.  
3.3 **Treatment of Exposure:** INHALATION: Remove to fresh air. If victim has breathing difficulty, administer oxygen. INGESTION: If victim is conscious, administer a pint of tepid water, then induce vomiting. EYES: Flush with water for at least 15 minutes. SKIN: Remove contaminated clothing and wash with soap and water. Call physician if complication develops.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 11.8 g/kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors/mists cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 390°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water fog, carbon dioxide, dry chemicals, alcohol foam.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Toxic acidic vapors may form.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 650°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 142.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 38.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** No reaction.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: +  
Damage to living resources: 3  
Human Oral hazard: (1)  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** Nitrogen Atmosphere.  
7.4 **Venting:** Pressure venting.  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 1  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 410.4  
9.3 **Boiling Point at 1 atm:** 480-510°F = 248-265°C = 521.2-538.2°K  
9.4 **Freezing Point:** -4°F = -20°C = 253.2°K (pour point)  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.130-1.155  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 14.2  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TRIXYLENYL PHOSPHATE

TRP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	68	190.000

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	302 392	0.000 0.006		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# THALLIUM SULFATE

TSU

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ratox Sulfuric acid, thallium salt Thallous sulfate Zello	Solid  Colorless to white  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID. Poisonous if swallowed or if skin is exposed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Pump

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $Tl_2SO_4$   
2.3 IMO/UN Designation: 6.1/1707  
2.4 DOT ID No.: 1707  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 52349

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Currently not available  
3.2 **Symptoms Following Exposure:** SKIN: Loss of hair and skin eruptions (keratinization, petechiae, ecchymoses). INGESTION OR SKIN ABSORPTION: Pain and tingling or numbness of the extremities, drooping eyelids, incoordination of muscular action, loss of hair, fever, inflamed and runny nose, conjunctivitis, abdominal pain, nausea and vomiting. Lethargy, jumbled speech, tremors, convulsions and cyanosis may follow. Pulmonary edema and pneumonia may precede death from respiratory failure.  
3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from exposure. EYES: Flush with running water. SKIN: Wash with soap and water. INGESTION: Induce vomiting and perform gastric lavage with a solution of 1% sodium or potassium iodide. Activated carbon may be effective if administered early. Castor oil (1 oz.) as a cathartic.  
3.4 **TLV-TWA:** 0.1 mg  $Tl/m^3$   
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4;  $LD_{50}$  <50 mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Chronic exposure may cause hair loss, atrophic changes in skin and nails, salivation, pigmentation of the gums, and renal damage. Psychotic symptoms such as nervousness, anxiety, depression, impaired memory, sloppiness and deteriorating work performance indicate organic brain damage. Tetatogenic effects in laboratory animals.  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 15 mg  $Tl/m^3$   
3.14 **OSHA PEL-TWA:** 0.1 mg  $Tl/m^3$   
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not pertinent  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.03 ppm/Atlantic Salmon/LC<sub>50</sub>  
10 ppm/96-hour/Brown Shrimp/LC<sub>50</sub>  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Probably high-is a cumulative poison.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** P115  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 504.85.  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** 1169.5°F = 632°C = 905.2°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 6.77 at 20°C.  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (Absorbs heat), 29.5 Btu/lb = 16.4 cal/g = 6.86 X 10<sup>5</sup> J/kg  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 10.9 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# THALLIUM SULFATE

TSU

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210	3.009 3.901 4.792 5.684 6.576 7.468 8.360 9.252 10.144 11.036 11.927 12.819 13.711 14.603 15.495 16.387 17.279 18.170		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# 1,2,3,5-TETRAMETHYLBENZENE

TTB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Isodurene	Liquid  Colorless  Floats on water.
<b>Wear full impervious protective clothing and approved respirator. Restrict access. Avoid contact with liquid and vapor. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.</b>	
<b>Fire</b>	Combustible. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 32; Aromatic hydrocarbons  
2.2 **Formula:** C<sub>6</sub>H<sub>2</sub>(CH<sub>3</sub>)<sub>4</sub>  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** 527-53-7  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.  
3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat.  
3.3 **Treatment of Exposure:** Call for medical aid. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 5.157 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 146°F C.C.  
4.2 **Flammable Limits in Air:** 0.82 - 7.72%  
4.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 801°F (est.)  
4.8 **Electrical Hazards:** Not listed.  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 64.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 17.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: -

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 85%; technical grades.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Open.  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 134.24  
9.3 **Boiling Point at 1 atm:** 386.6°F = 197°C = 470°K  
9.4 **Freezing Point:** -11.2°F = -24°C = 249°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.896  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1,2,3,5-TETRAMETHYLBENZENE

TTB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# 1-TETRADECENE

TTD

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Dodecylethylene	Watery liquid	Colorless	Mild pleasant odor
	Floats on water.		
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to eyes. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $\text{CH}_2(\text{CH}_2)_{11}\text{CH}=\text{CH}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51119

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield.  
3.2 Symptoms Following Exposure: Liquid may irritate eyes.  
3.3 Treatment of Exposure: EYES: flush with water for 15 min.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Non-volatile  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 230°F C.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: 455°F  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 100.0 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 28.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Technical: 96-99.6%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 196.38  
9.3 Boiling Point at 1 atm: 484.0°F = 251.1°C = 524.3°K  
9.4 Freezing Point: 8.8°F = -12.9°C = 260.3°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.771 at 20°C (liquid)  
9.8 Liquid Surface Tension: 25.0 dynes/cm = 0.025 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: 32.8 dynes/cm = 0.0328 N/m at 22.7°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.027  
9.12 Latent Heat of Vaporization: 103 Btu/lb = 57.1 cal/g =  $2.39 \times 10^5$  J/kg  
9.13 Heat of Combustion: -17,600 Btu/lb = -9,779 cal/g =  $-409.4 \times 10^5$  J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# 1-TETRADECENE

TTD

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	48.980	35	0.453	42	1.040	34	3.151
40	48.840	40	0.453	44	1.040	36	3.064
45	48.700	45	0.453	46	1.040	38	2.981
50	48.570	50	0.453	48	1.040	40	2.900
55	48.430	55	0.453	50	1.040	42	2.822
60	48.290	60	0.453	52	1.040	44	2.746
65	48.150	65	0.453	54	1.040	46	2.674
70	48.010	70	0.453	56	1.040	48	2.603
75	47.870	75	0.453	58	1.040	50	2.535
80	47.730	80	0.453	60	1.040	52	2.470
85	47.590	85	0.453	62	1.040	54	2.406
90	47.460	90	0.453	64	1.040	56	2.345
95	47.320	95	0.453	66	1.040	58	2.286
100	47.180	100	0.453	68	1.040	60	2.228
105	47.040	105	0.453	70	1.040	62	2.173
110	46.900	110	0.453	72	1.040	64	2.119
115	46.760	115	0.453	74	1.040	66	2.067
120	46.620	120	0.453	76	1.040	68	2.017
125	46.480					70	1.968
130	46.350					72	1.921
135	46.210					74	1.875
140	46.070					76	1.831
145	45.930					78	1.788
150	45.790					80	1.746
155	45.650					82	1.706
160	45.510					84	1.666

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	220	0.088	220	0.00236	0	0.338
	N	230	0.118	230	0.00312	25	0.353
	S	240	0.156	240	0.00407	50	0.368
	O	250	0.204	250	0.00526	75	0.383
	L	260	0.265	260	0.00673	100	0.397
	U	270	0.340	270	0.00853	125	0.412
	B	280	0.433	280	0.01071	150	0.426
	L	290	0.547	290	0.01334	175	0.440
	E	300	0.684	300	0.01648	200	0.453
		310	0.850	310	0.02020	225	0.467
		320	1.047	320	0.02458	250	0.480
		330	1.282	330	0.02970	275	0.493
		340	1.559	340	0.03566	300	0.506
		350	1.884	350	0.04256	325	0.519
		360	2.262	360	0.05049	350	0.532
		370	2.701	370	0.05956	375	0.544
		380	3.207	380	0.06988	400	0.557
		390	3.789	390	0.08158	425	0.569
		400	4.453	400	0.09477	450	0.581
		410	5.209	410	0.10960	475	0.593
		420	6.066	420	0.12620	500	0.604
		430	7.033	430	0.14460	525	0.616
		440	8.119	440	0.16510	550	0.627
		450	9.336	450	0.18780	575	0.638
		460	10.690	460	0.21270	600	0.649
		470	12.200	470	0.24020		

# TETRACHLOROETHYLENE

TTE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Perchloroethylene Perclene Perk Tetracap	Watery liquid      Colorless      Sweet odor  Sinks in water. Irritating vapor is produced.
Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Poisonous gases are produced when heated.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump  
Clean shore line

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{Cl}_2\text{C}=\text{CCl}_2$   
2.3 IMO/UN Designation: 9.0/1897  
2.4 DOT ID No.: 1897  
2.5 CAS Registry No.: 127-18-4  
2.6 NAERG Guide No.: 160  
2.7 Standard Industrial Trade Classification: 51133

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** For high vapor concentrations use approved canister or air-supplied mask; chemical goggles or face shield; plastic gloves.  
3.2 **Symptoms Following Exposure:** Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury.  
3.3 **Treatment of Exposure:** INHALATION: if illness occurs, remove patient to fresh air, keep him warm and quiet, and get medical attention. INGESTION: induce vomiting only on physician's recommendation. EYES AND SKIN: flush with plenty of water and get medical attention if irritation or injury occurs.  
3.4 **TLV-TWA:** 25 ppm  
3.5 **TLV-STEL:** 100 ppm  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or throat if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 5 ppm  
3.13 **IDLH Value:** 150 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** 300 ppm, 5 minute peak in any 3 hours  
3.16 **OSHA PEL-Ceiling:** 200 ppm  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic, irritating gases may be generated in fires.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Dry cleaning and industrial grades: 95+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U210/D039  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 165.83  
9.3 **Boiling Point at 1 atm:** 250°F = 121°C = 394°K  
9.4 **Freezing Point:** -8.3°F = -22.4°C = 250.8°K  
9.5 **Critical Temperature:** 656.6°F = 347°C = 620.2°K  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.63 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 31.3 dynes/cm = 0.0313 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 44.4 dynes/cm = 0.0444 N/m at 25°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.116  
9.12 **Latent Heat of Vaporization:** 90.2 Btu/lb = 50.1 cal/g =  $2.10 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# TETRACHLOROETHYLENE

TTE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	103.400	0	0.198		N	55	0.958
40	103.099	10	0.200		O	60	0.929
45	102.900	20	0.201		T	65	0.900
50	102.599	30	0.202			70	0.873
55	102.299	40	0.203		P	75	0.848
60	102.000	50	0.204		E	80	0.823
65	101.700	60	0.205		R	85	0.800
70	101.400	70	0.206		T	90	0.777
75	101.099	80	0.207		I	95	0.756
80	100.799	90	0.208		N	100	0.736
85	100.500	100	0.210		E	105	0.716
90	100.200	110	0.211		N	110	0.698
95	99.910	120	0.212		T	115	0.680
100	99.610	130	0.213			120	0.663
105	99.320	140	0.214			125	0.647
110	99.020	150	0.215			130	0.631
115	98.730	160	0.216			135	0.616
120	98.429	170	0.217			140	0.601
125	98.139	180	0.218			145	0.588
130	97.839	190	0.220			150	0.574
135	97.549	200	0.221			155	0.561
140	97.250	210	0.222			160	0.549
145	96.959					165	0.537
150	96.669					170	0.526
155	96.370					175	0.515
160	96.080						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.016	60	0.236	60	0.00702	0	0.108
		70	0.318	70	0.00929	25	0.110
		80	0.425	80	0.01216	50	0.113
		90	0.561	90	0.01575	75	0.116
		100	0.732	100	0.02022	100	0.118
		110	0.948	110	0.02571	125	0.120
		120	1.217	120	0.03242	150	0.122
		130	1.548	130	0.04055	175	0.125
		140	1.953	140	0.05032	200	0.127
		150	2.446	150	0.06199	225	0.129
		160	3.042	160	0.07583	250	0.131
		170	3.756	170	0.09215	275	0.132
		180	4.607	180	0.11130	300	0.134
		190	5.616	190	0.13360	325	0.136
		200	6.805	200	0.15940	350	0.138
		210	8.199	210	0.18910	375	0.139
		220	9.824	220	0.22330	400	0.141
		230	11.710	230	0.26230	425	0.142
		240	13.890	240	0.30660	450	0.143
		250	16.390	250	0.35680	475	0.144
		260	19.260	260	0.41330	500	0.146
		270	22.520	270	0.47680	525	0.147
		280	26.230	280	0.54790	550	0.148
						575	0.148
						600	0.149



# 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE

TTF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ethane, 1,1,2-trichloro- 1,2,2-trifluoro- Freon 113 Frigen 113TR 1,1,2-Trichlorotrifluoroethane	Liquid	Colorless	Sweet, ether-like odor
Sinks in water.			
Wear self-contained positive pressure breathing apparatus and full impervious protective clothing. Evacuate area in case of large discharge. Notify local health and pollution control agencies.			
<b>Fire</b>	Not flammable. POISONOUS GASES ARE PRODUCED IN FIRE. Container may explode in fire. Wear self-contained positive pressure breathing apparatus, impervious clothing and gloves. Extinguish adjacent fires with water spray, fog or foam, carbon dioxide, or dry chemical. Cool exposed containers with water spray.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, throat, lungs and skin. If inhaled, anesthetic or narcotic effect may occur. Asphyxiant. Move to fresh air. If breathing has stoped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. IF IN EYES OR ON SKIN, hold eyelids open and flush with water for at least 15 minutes; hold eyelids open if necessary. Remove contaminated clothing and shoes at the site.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life if unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 36; Halogenated hydrocarbons  
2.2 **Formula:** CCl<sub>2</sub>FCF<sub>2</sub>Cl  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** 76-13-1  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51137

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained positive pressure breathing apparatus and full protective clothing.
- 3.2 **Symptoms Following Exposure:** Inhalation causes irritation of the nose, throat, and lungs. High concentrations may cause death by respiratory failure or asphyxiation. May produce superficial skin burns or deflating type dermatitis and may irritate the eyes.
- 3.3 **Treatment of Exposure:** Call for medical aid. INHALATION: Move to fresh air. If breathing stops, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: Treat symptomatically and supportively. EYES OR SKIN: Flush with running water for at least 15 minutes; hold eyelids open if necessary. Clean skin with soap or mild detergent. Remove and isolate contaminated clothing and shoes at the site.
- 3.4 **TLV-TWA:** 1000 ppm.  
3.5 **TLV-STEL:** 1250 ppm  
3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 43 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Chronic inhalation may cause cardiac arrhythmias. Poisoning may affect liver and kidneys.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will not tolerate moderate or high concentrations.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on skin and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 45 ppm.  
3.13 **IDLH Value:** 2,000 ppm  
3.14 **OSHA PEL-TWA:** 1,000 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable.
- 4.2 **Flammable Limits in Air:** Not pertinent.
- 4.3 **Fire Extinguishing Agents:** Extinguish fires with material appropriate to the surrounding materials.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.
- 4.5 **Special Hazards of Combustion Products:** Toxic gases including hydrogen chloride, hydrogen fluoride, and very small amounts of phosgene, fluorine and chlorine are produced.
- 4.6 **Behavior in Fire:** While no flash point is reported, the material may burn if ignited by a high intensity heat source.
- 4.7 **Auto Ignition Temperature:** Not pertinent.
- 4.8 **Electrical Hazards:** Not listed.
- 4.9 **Burning Rate:** Not pertinent.
- 4.10 **Adiabatic Flame Temperature:** Not pertinent.
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Not pertinent.
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.
- 5.2 **Reactivity with Common Materials:** Incompatible with alkali metals, with which violent reactions are possible. May form shock sensitive or explosive mixtures with powdered metals.
- 5.3 **Stability During Transport:** Stable.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 5.5 **Polymerization:** Will not polymerize.
- 5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 0  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical grades; 99.9%.
- 7.2 **Storage Temperature:** Ambient.
- 7.3 **Inert Atmosphere:** No requirement.
- 7.4 **Venting:** Open.
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent.
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 187.37
- 9.3 **Boiling Point at 1 atm:** 118°F = 48°C = 321°K
- 9.4 **Freezing Point:** -34°F = -36°C = 237°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.5635 at 25°C
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** 6.47
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent.
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE

TTF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
77	13.050		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	120	0.497

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.017	68	5.493	68	0.18165		C U R R E N T L Y  N O T  A V A I L A B L E

# TETRAETHYLENE GLYCOL

TTG

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Hi-dry Bis-[2-(2-Hydroxyethoxy) ethyl ether 3,6,9-Trixaundecan-1, 11-di-ol	Liquid  Colorless to straw color  Mild odor  Sinks and mixes with water.
Keep people away. Avoid contact with liquid. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	LIQUID Not harmful.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 40; Glycol ether
- 2.2 Formula:  $\text{HO}(\text{C}_2\text{H}_4\text{O})_4\text{H}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 112-60-7
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51617

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield and rubber gloves.
- 3.2 Symptoms Following Exposure: Compound is nonirritating. No symptoms observed by any exposure route.
- 3.3 Treatment of Exposure: INGESTION: if large amounts are swallowed, induce vomiting; treat symptomatically. EYES: flush with water; get medical attention if ill effects develop. SKIN: wash with soap and water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 0; oral rat  $\text{LD}_{50}$  = 28-34 g/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat.
- 3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: 360°F O.C.
- 4.2 Flammable Limits in Air: Currently not available
- 4.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Currently not available
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Currently not available
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 47.6 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 17.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: May attack some forms of plastics
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): 50%, 5 days
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: (0)
  - Human Oral hazard: 0
  - Human Contact hazard: 0
  - Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial, 99+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open (flame arrester)
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	1
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 194.23
- 9.3 Boiling Point at 1 atm: 621°F = 327°C = 600°K
- 9.4 Freezing Point: 24.8°F = 4.0°C = 269.0°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.12 at 20°C (liquid)
- 9.8 Liquid Surface Tension: 18.81 dynes/cm = 0.01881 N/m at 327°C
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: -10,530 Btu/lb = -5,850 cal/g = -245 X 10<sup>3</sup> J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Low

NOTES

# TETRAETHYLENE GLYCOL

TTG

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	71.089	N O T  P E R T I N E N T	N O T  P E R T I N E N T	N O T  P E R T I N E N T	N O T  P E R T I N E N T	77	44.600
36	71.020						
38	70.950						
40	70.879						
42	70.809						
44	70.750						
46	70.679						
48	70.610						
50	70.540						
52	70.469						
54	70.400						
56	70.330						
58	70.259						
60	70.190						
62	70.120						
64	70.049						
66	69.980						
68	69.910						
70	69.839						
72	69.770						
74	69.700						
76	69.639						
78	69.570						
80	69.500						
82	69.429						
84	69.360						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
M I S C I B L E		575	12.130	575	0.21220	N O T  P E R T I N E N T	
		580	13.270	580	0.23090		
		585	14.500	585	0.25110		
		590	15.830	590	0.27290		
		595	17.270	595	0.29630		
		600	18.830	600	0.32150		
		605	20.510	605	0.34850		
		610	22.320	610	0.37750		
		615	24.270	615	0.40860		
		620	26.370	620	0.44190		
		625	28.630	625	0.47760		
		630	31.060	630	0.51580		
		635	33.670	635	0.55660		
		640	36.480	640	0.60020		
		645	39.490	645	0.64680		
		650	42.720	650	0.69660		
		655	46.180	655	0.74960		
		660	49.890	660	0.80620		
		665	53.850	665	0.86640		

# TETRADECANOL

TTN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Myristic alcohol Myristyl alcohol 1-Tetradecanol n-Tetradecyl alcohol	Thick liquid (heated)    Colorless    Faint alcohol odor  Solidifies and floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 20; Alcohol  
 2.2 Formula:  $\text{CH}_3(\text{CH}_2)_{12}\text{CH}_2\text{OH}$   
 2.3 IMO/UN Designation: Not listed  
 2.4 DOT ID No.: Not listed  
 2.5 CAS Registry No.: Currently not available  
 2.6 NAERG Guide No.: Not listed  
 2.7 Standard Industrial Trade Classification: 51219

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield.  
 3.2 Symptoms Following Exposure: Low toxicity. Overexposure causes some central nervous system depression. Prolonged skin contact causes skin irritation.  
 3.3 Treatment of Exposure: INGESTION: induce vomiting and call a doctor; if necessary, support respiration. EYES AND SKIN: flush with copious amounts of water.  
 3.4 TLV-TWA: Not listed.  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 Toxicity by Ingestion: Grade 1;  $\text{LD}_{50} = 5$  to 15 g/kg  
 3.8 Toxicity by Inhalation: Currently not available.  
 3.9 Chronic Toxicity: Currently not available  
 3.10 Vapor (Gas) Irritant Characteristics: Non-volatile  
 3.11 Liquid or Solid Characteristics: Prolonged contact with skin may cause irritation.  
 3.12 Odor Threshold: Currently not available  
 3.13 IDLH Value: Not listed.  
 3.14 OSHA PEL-TWA: Not listed.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 285°F O.C.  
 4.2 Flammable Limits in Air: Not pertinent  
 4.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide  
 4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
 4.5 Special Hazards of Combustion Products: Not pertinent  
 4.6 Behavior in Fire: Not pertinent  
 4.7 Auto Ignition Temperature: Currently not available  
 4.8 Electrical Hazards: Not pertinent  
 4.9 Burning Rate: Currently not available  
 4.10 Adiabatic Flame Temperature: Currently not available  
 4.11 Stoichiometric Air to Fuel Ratio: 100.0 (calc.)  
 4.12 Flame Temperature: Currently not available  
 4.13 Combustion Molar Ratio (Reactant to Product): 29.0 (calc.)  
 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
 5.2 Reactivity with Common Materials: No reaction  
 5.3 Stability During Transport: Stable  
 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
 5.5 Polymerization: Not pertinent  
 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
 6.2 Waterfowl Toxicity: Currently not available  
 6.3 Biological Oxygen Demand (BOD): Currently not available  
 6.4 Food Chain Concentration Potential: None  
 6.5 GESAMP Hazard Profile:  
 Bioaccumulation: 0  
 Damage to living resources: 0  
 Human Oral hazard: 0  
 Human Contact hazard: I  
 Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: 96-99+%  
 7.2 Storage Temperature: Ambient  
 7.3 Inert Atmosphere: No requirement  
 7.4 Venting: Open (flame arrester)  
 7.5 IMO Pollution Category: Currently not available  
 7.6 Ship Type: Currently not available  
 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
 8.2 49 CFR Class: Not pertinent  
 8.3 49 CFR Package Group: Not listed.  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Solid  
 9.2 Molecular Weight: 214.38  
 9.3 Boiling Point at 1 atm: 505.8°F = 263.2°C = 536.4°K  
 9.4 Freezing Point: 99.7°F = 37.6°C = 310.8°K  
 9.5 Critical Temperature: 804.2°F = 429°C = 702.2°K  
 9.6 Critical Pressure: Not pertinent  
 9.7 Specific Gravity: 0.824 at 38°C (liquid)  
 9.8 Liquid Surface Tension: 23.7 dynes/cm = 0.0237 N/m at 20°C  
 9.9 Liquid Water Interfacial Tension: Currently not available  
 9.10 Vapor (Gas) Specific Gravity: Not pertinent  
 9.11 Ratio of Specific Heats of Vapor (Gas): 1.026  
 9.12 Latent Heat of Vaporization: Not pertinent  
 9.13 Heat of Combustion: Currently not available  
 9.14 Heat of Decomposition: Not pertinent  
 9.15 Heat of Solution: Not pertinent  
 9.16 Heat of Polymerization: Not pertinent  
 9.17 Heat of Fusion: Currently not available  
 9.18 Limiting Value: Currently not available  
 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# TETRADECANOL

TTN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
105	51.220	100	0.576	104	1.040	104	5.997
110	51.080	102	0.583	105	1.040	105	5.863
115	50.940	104	0.589	106	1.040	106	5.732
120	50.810	106	0.596	107	1.040	107	5.605
125	50.670	108	0.602	108	1.040	108	5.481
130	50.530	110	0.609	109	1.040	109	5.360
135	50.390	112	0.616	110	1.040	110	5.242
140	50.250	114	0.622	111	1.040	111	5.127
145	50.110	116	0.629	112	1.040	112	5.015
150	49.970	118	0.635	113	1.040	113	4.906
155	49.830	120	0.642	114	1.040	114	4.800
160	49.700	122	0.648	115	1.040	115	4.696
165	49.560	124	0.655	116	1.040	116	4.595
170	49.420	126	0.661	117	1.040	117	4.497
175	49.280	128	0.668	118	1.040	118	4.400
180	49.140	130	0.675	119	1.040	119	4.307
185	49.000	132	0.681	120	1.040	120	4.215
190	48.860	134	0.688	121	1.040	121	4.126
195	48.720	136	0.694				
200	48.590	138	0.701				
205	48.450	140	0.707				
210	48.310	142	0.714				
		144	0.720				
		146	0.727				
		148	0.734				
		150	0.740				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	105	0.000	105	0.00000	0	0.333
	N	110	0.000	110	0.00000	25	0.348
	S	115	0.000	115	0.00000	50	0.362
	O	120	0.000	120	0.00000	75	0.376
	L	125	0.000	125	0.00000	100	0.391
	U	130	0.000	130	0.00000	125	0.404
	B	135	0.000	135	0.00000	150	0.418
	I	140	0.000	140	0.00001	175	0.432
	E	145	0.000	145	0.00001	200	0.445
		150	0.000	150	0.00001	225	0.458
		155	0.000	155	0.00001	250	0.471
		160	0.001	160	0.00002	275	0.484
		165	0.001	165	0.00002	300	0.497
		170	0.001	170	0.00003	325	0.510
		175	0.001	175	0.00004	350	0.522
		180	0.001	180	0.00004	375	0.534
						400	0.546
						425	0.558
						450	0.570
						475	0.581
						500	0.593
						525	0.604
						550	0.615
						575	0.626
						600	0.637

# TETRAETHYLENEPENTAMINE

TTP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,11-Diamino-3,6,9-triazaundecane	Liquid	Yellow	Ammonia odor
May float or sink in water.			
Keep people away. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Will burn skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 7; Aliphatic amine 2.2 Formula: $\text{H}_2\text{N}(\text{C}_2\text{H}_4\text{NH})_4\text{H}$ 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 2320 2.5 CAS Registry No.: 112-57-2 2.6 NAERG Guide No.: 153 2.7 Standard Industrial Trade Classification: 51452
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Air-supplied respirator; rubber gloves; complete eye protection; impervious apron 3.2 <b>Symptoms Following Exposure:</b> Inhalation may cause nausea and slight irritation; compound is a sensitizer, and prolonged contact may cause asthma. Ingestion can cause burns of mouth, esophagus, and possibly stomach. Contact with eyes or skin may cause burns. Repeated skin contact may cause dermatitis. 3.3 <b>Treatment of Exposure:</b> INHALATION: remove victim to fresh air; give oxygen if breathing is difficult; treat allergic manifestations by usual methods. INGESTION: do NOT induce vomiting; give large quantities of water; give at least one ounce of vinegar in an equal amount of water; get medical attention. EYES: immediately flush with plenty of water; get medical care. SKIN: flush with plenty of water. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; oral $\text{LD}_{50} = 3,990 \text{ mg/kg}$ (rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 3.11 <b>Liquid or Solid Characteristics:</b> Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 Flash Point: 325°F O.C.  
4.2 Flammable Limits in Air: 0.8%-4.6%  
4.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion  
Products: Ammonia and toxic oxides of nitrogen may form in fires.  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: 610°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 89.3 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 24.5 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: May attack some forms of plastics  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: D  
7.6 Ship Type: 3  
7.7 Barge Hull Type: 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material  
8.2 49 CFR Class: 8  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 189  
9.3 Boiling Point at 1 atm: 644°F = 340°C = 613°K  
9.4 Freezing Point: -22°F = -30°C = 243°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.998 at 20°C (liquid)  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Currently not available  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Low

## NOTES

# TETRAETHYLENEPENTAMINE

TTP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	62.300		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# TITANIUM TETRACHLORIDE

TTT

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Watery liquid      Colorless to light yellow      Irritating odor

Reacts violently with water. Produces dense fumes in air.

Evacuate.  
Keep people away. **AVOID CONTACT WITH LIQUID AND VAPOR.**  
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).  
Notify local health and pollution control agencies.

### Fire

Not flammable.  
DO NOT USE WATER ON ADJACENT FIRES.

### Exposure

CALL FOR MEDICAL AID.

#### VAPOR

Irritating to eyes, nose and throat.  
If inhaled, will cause coughing or headache.  
Move to fresh air.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

#### LIQUID

Will burn skin and eyes.  
If swallowed, will cause nausea and vomiting.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Dangerous to aquatic life in high concentrations.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{TiCl}_4$   
2.3 IMO/UN Designation: 8.0/1838  
2.4 DOT ID No.: 1838  
2.5 CAS Registry No.: 7550-45-0  
2.6 NAERG Guide No.: 137  
2.7 Standard Industrial Trade Classification: 52329

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles and face shield; air-supplied mask or approved canister; rubber gloves; protective clothing.
- 3.2 **Symptoms Following Exposure:** Vapors can cause severe irritation and damage to eyes, coughing, headache, dizziness, lung damage, bronchial pneumonia. Liquid causes thermal and acid burns of eyes, skin, throat, and stomach. If ingested, causes nausea, vomiting, cramps, diarrhea, and possible tissue ulceration.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if symptoms persist, call a doctor. INGESTION: give large amounts of water, then induce vomiting; give milk, eggs or olive oil; call a doctor. EYES: immediately flush with copious amounts of water for at least 15 min; call a doctor. SKIN: flush with water; obtain medical attention if irritation persists.
- 3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Disturbances of upper respiratory and nervous system in man.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapor is moderately irritating such that personnel will not tolerate moderate or high vapor concentrations.
- 3.11 **Liquid or Solid Characteristics:** Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Dry powder or carbon dioxide on adjacent fires.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Do not use water if it can contact titanium tetrachloride.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** If container leaks, a very dense white fume forms and can obscure operations.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts with moisture in air, forming dense white fume. Reaction with liquid water gives off heat and forms hydrochloric acid.
- 5.2 **Reactivity with Common Materials:** The acid formed by reaction with moisture attacks metals, forming flammable hydrogen gas.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Acid formed by reaction with water can be neutralized by limestone, lime, or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material
- 8.2 49 CFR Class: 8
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 4              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 2              |
| Special (White).....      | W              |
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCL List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 189.71
- 9.3 **Boiling Point at 1 atm:** 277°F = 136°C = 409°K
- 9.4 **Freezing Point:** -11°F = -24°C = 249°K
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 1.726 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.221
- 9.12 **Latent Heat of Vaporization:** 79.7 Btu/lb = 44.3 cal/g = 1.86 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** -482.8 Btu/lb = -268.2 cal/g = -11.22 X 10<sup>5</sup> J/kg
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# TITANIUM TETRACHLORIDE

TTT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	109.700	40	0.190		N		N
40	109.400	50	0.190		O		O
45	109.099	60	0.190		T		T
50	108.799	70	0.190				
55	108.500	80	0.190		P		P
60	108.200	90	0.190		E		E
65	107.900	100	0.190		R		R
70	107.599	110	0.190		T		T
75	107.299	120	0.190		I		I
80	107.000	130	0.190		N		N
85	106.700	140	0.190		E		E
90	106.400	150	0.190		N		N
95	106.099	160	0.190		T		T
100	105.900	170	0.190				
105	105.599	180	0.190				
110	105.299	190	0.190				
115	105.000	200	0.190				
120	104.700	210	0.190				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	10	0.022	10	0.00082	85	0.058
	E	20	0.033	20	0.00122	90	0.058
	A	30	0.049	30	0.00176	95	0.058
	C	40	0.071	40	0.00250	100	0.058
	T	50	0.100	50	0.00348	105	0.058
	S	60	0.140	60	0.00477	110	0.058
		70	0.193	70	0.00644	115	0.058
		80	0.262	80	0.00857	120	0.058
		90	0.350	90	0.01125	125	0.058
		100	0.462	100	0.01458	130	0.058
		110	0.602	110	0.01868	135	0.058
		120	0.777	120	0.02368	140	0.058
		130	0.991	130	0.02971	145	0.058
		140	1.253	140	0.03693	150	0.058
		150	1.569	150	0.04547	155	0.058
		160	1.947	160	0.05553	160	0.058
		170	2.397	170	0.06727	165	0.058
		180	2.927	180	0.08087	170	0.058
		190	3.549	190	0.09654		
		200	4.273	200	0.11450		
		210	5.111	210	0.13490		
		220	6.076	220	0.15800		
		230	7.179	230	0.18400		
		240	8.436	240	0.21310		
		250	9.859	250	0.24550		
		260	11.460	260	0.28150		

# TOXAPHENE

TXP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Octachlorocamphene	Waxy solid or in solution	Amber	Mild turpentine odor
Solid sinks in water, solution floats on water.			
Keep people away. Call fire department. Avoid contact with solid and solution. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Solid not flammable, but usually dissolved in combustible liquid. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with foam, dry chemical or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR SOLUTION POISONOUS IF SWALLOWED. Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim quiet and warm.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Solution is fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Collection Systems: Dredge Do not burn Salvage waterfowl	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $C_{10}H_4Cl_8$ 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 2761 2.5 CAS Registry No.: 8001-35-2 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 51139
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Chemical-type respirator; rubber gloves; chemical goggles or face shield. 3.2 <b>Symptoms Following Exposure:</b> May be absorbed through skin, lungs, or intestinal tract. Symptoms include salivation, leg and back muscle spasms, nausea, vomiting, hyperexcitability, tremors, shivering, clonic convulsions, then tetanic contractions of all skeletal muscles. Lethal doses cause respiratory failure. Respiration, affected as a result of the exertion from vomiting or convulsions, is first arrested because of tetanic muscular contractions, then increased in both amplitude and rate as the muscles relax. 3.3 <b>Treatment of Exposure:</b> If symptoms of poisoning appear, promptly remove the unabsorbed pesticide from the stomach by inducing vomiting with warm salty or soapy water (if the patient is conscious) or from the skin with soap and water. Keep patient warm and quiet. Call a physician. 3.4 <b>TLV-TWA:</b> 0.5 mg/m <sup>3</sup> (skin) 3.5 <b>TLV-STEL:</b> 1 mg/m <sup>3</sup> (skin) 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 4; LD <sub>50</sub> below 50 mg/kg (dog) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> The solid is non-volatile. For solutions, see meta-xylene. 3.11 <b>Liquid or Solid Characteristics:</b> Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 200 mg/m <sup>3</sup> (skin) 3.14 <b>OSHA PEL-TWA:</b> 0.5 mg/m <sup>3</sup> (skin) 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 84°F C.C. (solution)  
4.2 **Flammable Limits in Air:** 1.1%-6.4% (solvent only)  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Toxic vapors are generated when heated.  
4.6 **Behavior in Fire:** Solution in xylene may produce corrosive products when heated.  
4.7 **Auto Ignition Temperature:** 986°F (solution)  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 5.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
0.05 ppm/20 days/goldfish/100% kill/fresh water  
0.02 ppm/bluegill/100% kill/fresh water  
0.0032 ppm/24 hr/spot/100% kill/salt water  
\*Time period not specified.  
6.2 **Waterfowl Toxicity:** 30.8 mg/kg  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; 40% dust concentrate; 90% solution in xylene  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Sealed containers in well-ventilated area  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1 pound  
8.7 **EPA Pollution Category:** X  
8.8 **RCRA Waste Number:** P123  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Waxy solid  
9.2 **Molecular Weight:** 414 (avg.)  
9.3 **Boiling Point at 1 atm:** Decomposes  
9.4 **Freezing Point:** 149–194°F = 65–90°C = 338–363°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.6 at 15°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# TOXAPHENE

TXP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# URANYL NITRATE

UAN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Uranium nitrate	Solid  Light yellow  Odorless  Mixes with water.
Evacuate. Keep people away. Avoid contact with solid and dust. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. POISONOUS GASES MAY BE PRODUCED IN FIRE. Combat fires from safe distance or protected location. Flood discharge area with water.
<b>Exposure</b>	Call for medical aid. DUST Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{UO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$   
2.3 IMO/UN Designation: 7/2981  
2.4 DOT ID No.: 2981  
2.5 CAS Registry No.: 10102-06-4  
2.6 NAERG Guide No.: 162  
2.7 Standard Industrial Trade Classification: 52511

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask, gloves, goggles  
3.2 **Symptoms Following Exposure:** Excessive inhalation of dust may cause irritation of lungs and delayed symptoms similar to those observed after ingestion. Dust irritates eyes and skin and may be absorbed through skin on prolonged exposure. Ingestion causes irritation of mouth and stomach; inflammation of kidney and liver develops 1 to 4 days after exposure.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. EYES: flush with water for at least 15 min.; see physician if irritation persists. SKIN: wash thoroughly with soap and water. INGESTION: administer large doses of sodium bicarbonate. (This will convert the uranium salt to the bicarbonate, which is much less toxic.) Additional treatment is symptomatic; get medical attention.  
3.4 **TLV-TWA:** 0.2 mg/m<sup>3</sup> (as uranium)  
3.5 **TLV-STEL:** 0.6 mg/m<sup>3</sup> (as uranium)  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Delayed inflammation of kidneys. Airborne radioactive particles have apparently been responsible for a significantly increased death rate from lung cancer among long-term uranium miners.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** 10 mg U/m<sup>3</sup>  
3.14 **OSHA PEL-TWA:** 0.05 mg/m<sup>3</sup> (as uranium)  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable, but may cause fire on contact with combustibles  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Flooding amounts of water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen formed in fires.  
4.6 **Behavior in Fire:** Intensifies fires. When large quantities are involved, nitrate may fuse or melt; application of water may then cause extensive scattering of molten material.  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves, forming weak solution of nitric acid; the reaction is not hazardous.  
5.2 **Reactivity with Common Materials:** In contact with easily oxidizable substances, may react rapidly enough to cause ignition, violent combustion, or explosion. Water solutions are acidic and can corrode metals.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Wash with water.  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
3.1 mg/1/96 hr/fathead minnow/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Analytical reagent  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Radioactive material  
8.2 **49 CFR Class:** 7  
8.3 **49 CFR Package Group:** Not pertinent.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	0
Instability (Yellow).....	0
Special (White).....	OX

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 502.13  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** 140.4°F = 60.2°C = 333.4°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 2.81 at 13°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# URANYL NITRATE

UAN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	60.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# UREA, AMMONIUM NITRATE SOLN (W/AQUA AMMONIA)

UAS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Liquamon 28 Uran, rustica	Liquid  Clear  Slight ammonia odor  Miscible in water.
Keep people away. Notify local health and pollution control agencies. Wear rubber overclothing (including gloves)	
<b>Fire</b>	Not Flammable POISONOUS GASES MAY BE PRODUCED IF HEATED. Extinguish with water.
<b>Exposure</b>	Call for medical aid. Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. IF ON SKIN, flush skin thoroughly and immediately with water. If irritation persists obtain medical aid. IF IN EYES, flush eyes with water for 15 minutes or until irritation subsides. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 6; Ammonia
- 2.2 Formula:  $\text{H}_2\text{ONH}_2\text{HNO}_2\text{CO}(\text{NH}_2)_2$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 15978-77-5
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves, safety glasses, clothes that minimize skin exposure.
- 3.2 **Symptoms Following Exposure:** INHALATION: Irritation of mucous membranes may result from exposure. EYES and SKIN: Irritation may result from exposure. INGESTION: Nausea, possible vomiting and diarrhea. Methemoglobinemia may occur, particularly in children under 1 year of age.
- 3.3 **Treatment of Exposure:** INHALATION: Evacuate to fresh air and give artificial resuscitation. Keep under observation for 24 hours as symptoms may be delayed. EYES: Flush eyes with water for 15 minutes or until irritation subsides. SKIN: Wash contaminated surface with soap and water. If irritation develops consult a physician. INGESTION: Give milk and demulcents, induce emesis or perform gastric lavage: give fluids; observe for methemoglobinemia, particularly in infants. If needed, give methylene blue as a 1% solution intravenously, 1 to 2 mg/ kg; and if severe, consider exchange transfusion.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 3.0 \text{ g/kg}$  (female rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to eyes and throat.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Water
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Heating to decomposition yields oxides of nitrogen.
- 4.6 **Behavior in Fire:** Organic and oxidizable materials can sensitize DRY ammonium nitrate to readily explosable state; can detonate if heated under confinement with high pressure.
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not pertinent.
- 4.10 **Adiabatic Flame Temperature:** Not pertinent.
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Not pertinent.
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Copper or copper alloys are prohibited materials.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Will not occur.
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**
  - Bioaccumulation: 0
  - Damage to living resources: 1
  - Human Oral hazard: 1
  - Human Contact hazard: 0
  - Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Ammonium Nitrate: 44-45% by wt.; Urea: 34-35% by wt.;  $\text{H}_2\text{O}$ : 20-22% by wt.
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Pressure vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** Not pertinent
- 9.3 **Boiling Point at 1 atm:**  $225^\circ\text{F} = 107^\circ\text{C} = 380.2^\circ\text{K}$
- 9.4 **Freezing Point:** Currently not available
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.326 at  $15.56^\circ\text{C}$
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Currently not available
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# UREA, AMMONIUM NITRATE SOLN (W/AQUA AMMONIA)

UAS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# UNDECANOIC ACID

UDA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Decanecarboxylic acid Hendecanoic acid n-Undecanoic acid n-Undecic acid n-Undecylic acid	Crystalline solid      White
<b>Keep people away.</b> <b>Avoid contact with liquid and vapor.</b> <b>Wear rubber overclothing (including gloves).</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b>	
<b>Fire</b>	Combustible. Water may be ineffective on fire. Wear self-contained breathing apparatus and protective clothing. Extinguish with dry chemical, alcohol foam, or CO <sub>2</sub> .
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR/MIST OR DUST Irritating to eyes, nose and throat. If inhaled, will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID Will burn skin and eyes. If swallowed may cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	May be dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 4; Organic acids.  
2.2 **Formula:** CH<sub>3</sub>(CH<sub>2</sub>)<sub>9</sub>CO<sub>2</sub>H  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed  
2.5 **CAS Registry No.:** 112-37-8  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 51377

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Currently not available  
3.2 **Symptoms Following Exposure:** May be harmful by inhalation, ingestion or skin absorption. Material is irritating to mucous membrane and upper respiratory tract. Causes eye and skin irritation.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Remove the victim to fresh air. If not breathing give artificial respiration. If breathing is difficult give oxygen. EYES OR SKIN: Flush with copious amounts of water for at least 15 minutes. Insure adequate flushing of the eyes by separating the eyelids with the fingers.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors, dust or mist cause severe irritation of the eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eye.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
>230°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, alcohol foam, water spray.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may not be effective.  
4.5 **Special Hazards of Combustion Products:** Dust explosion is possible.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 73.8 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 22.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Corrosive solution may attack some common metals.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Sodium bicarbonate solution  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: (1)  
Human Contact hazard: 1  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 186.3  
9.3 **Boiling Point at 1 atm:** 442.2°F = 228°C = 501.2°K (at 160 mm-Hg = .211 atm)  
9.4 **Freezing Point:** 83.3°F = 28.5°C = 301.7°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.891  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** 6.42  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# UNDECANOIC ACID

UDA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	215 272 300 331 366 387 415 460 505 554	0.019 0.097 0.193 0.387 0.774 1.160 1.934 3.867 7.735 14.696		C U R R E N T L Y  N O T  A V A I L A B L E	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.323 0.337 0.350 0.363 0.376 0.388 0.401 0.413 0.424 0.436 0.447 0.459 0.470 0.480 0.491 0.501 0.511 0.521 0.531 0.540 0.550 0.559 0.568 0.577 0.585

# N-UNDECYL BENZENE

UDB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1-Phenylundecane	Liquid                      Colorless                      Mild odor  Floats on water.
Keep people away. Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim  
 Chemical and Physical Treatment:  
 Absorb  
 Clean shore line  
 Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 32; Aromatic Hydrocarbon  
 2.2 **Formula:** C<sub>6</sub>H<sub>5</sub>(CH<sub>2</sub>)<sub>10</sub>CH<sub>3</sub>  
 2.3 **IMO/UN Designation:** Not listed  
 2.4 **DOT ID No.:** Not listed  
 2.5 **CAS Registry No.:** Currently not available  
 2.6 **NAERG Guide No.:** Not listed  
 2.7 **Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Goggles or face shield and rubber gloves.  
 3.2 **Symptoms Following Exposure:** Ingestion may cause intestinal disturbances. Contact with eyes causes mild irritation.  
 3.3 **Treatment of Exposure:** INGESTION: induce vomiting if large amount has been swallowed. EYES: flush with water. SKIN: remove spills on skin or clothing by washing with soap and water.  
 3.4 **TLV-TWA:** Not listed.  
 3.5 **TLV-STEL:** Not listed.  
 3.6 **TLV-Ceiling:** Not listed.  
 3.7 **Toxicity by Ingestion:** Currently not available  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Currently not available  
 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
 3.11 **Liquid or Solid Characteristics:** Currently not available  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 **OSHA PEL-TWA:** Not listed.  
 3.15 **OSHA PEL-STEL:** Not listed.  
 3.16 **OSHA PEL-Ceiling:** Not listed.  
 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 285°F C.C.  
 4.2 **Flammable Limits in Air:** Currently not available  
 4.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
 4.5 **Special Hazards of Combustion Products:** Currently not available  
 4.6 **Behavior in Fire:** Currently not available  
 4.7 **Auto Ignition Temperature:** Currently not available  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 114.2 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 31.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** May attack some forms of plastics  
 5.3 **Stability During Transport:** Stable  
 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
 5.5 **Polymerization:** Not pertinent  
 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Mixture with decylbenzene and dodecylbenzene, all of which have same general properties  
 7.2 **Storage Temperature:** Ambient  
 7.3 **Inert Atmosphere:** No requirement  
 7.4 **Venting:** Open (flame arrester)  
 7.5 **IMO Pollution Category:** D  
 7.6 **Ship Type:** Data not available  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
 8.2 **49 CFR Class:** Not pertinent  
 8.3 **49 CFR Package Group:** Not listed.  
 8.4 **Marine Pollutant:** No  
 8.5 **NFPA Hazard Classification:** Not listed  
 8.6 **EPA Reportable Quantity:** Not listed.  
 8.7 **EPA Pollution Category:** Not listed.  
 8.8 **RCRA Waste Number:** Not listed  
 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 232.4  
 9.3 **Boiling Point at 1 atm:** 601°F = 316°C = 589°K  
 9.4 **Freezing Point:** 23°F = -5°C = 268°K  
 9.5 **Critical Temperature:** 918.1°F = 492.3°C = 765.5°K  
 9.6 **Critical Pressure:** 234 psia = 15.9 atm = 1.61 MN/m<sup>2</sup>  
 9.7 **Specific Gravity:** 0.855 at 20°C (liquid)  
 9.8 **Liquid Surface Tension:** Currently not available  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
 9.12 **Latent Heat of Vaporization:** 101.27 Btu/lb = 56.26 cal/g = 2.354 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -19,490 Btu/lb = -10,830 cal/g = -453.1 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Not pertinent  
 9.15 **Heat of Solution:** Not pertinent  
 9.16 **Heat of Polymerization:** Not pertinent  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# N-UNDECYL BENZENE

UDB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
52	53.760		N		N	55	5.463
54	53.710		O		O	60	5.087
56	53.660		T		T	65	4.744
58	53.610					70	4.430
60	53.560		P		P	75	4.141
62	53.520		E		E	80	3.877
64	53.470		R		R	85	3.633
66	53.420		T		T	90	3.409
68	53.370		I		I	95	3.203
70	53.320		N		N	100	3.012
72	53.270		E		E	105	2.836
74	53.220		N		N	110	2.673
76	53.180		T		T	115	2.522
78	53.130					120	2.382
80	53.080						
82	53.030						
84	52.980						
86	52.930						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

## 1-UNDECENE

UDC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> n-Nonylethylene	Liquid  Colorless  Mild odor  Floats on water.
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.	
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_9\text{CH}=\text{CH}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51119

## 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves.  
3.2 **Symptoms Following Exposure:** Aspiration hazard if ingested. Slight skin and eye irritation. No inhalation hazard expected.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. INGESTION: do NOT lavage or induce vomiting; give vegetable oil and demulcents; call a doctor. EYES: flush with water for 15 min. SKIN: wipe off, wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Slight smarting of eyes and respiratory system at high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

4.1 **Flash Point:** 160°F O.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 4.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 78.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 22.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: (1)  
Human Contact hazard: 0  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Technical: 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 154.2  
9.3 **Boiling Point at 1 atm:** 378.9°F = 192.7°C = 465.9°K  
9.4 **Freezing Point:** -56°F = 49°C = 224°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.750 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 23.4 dynes/cm = 0.0234 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.050 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.035  
9.12 **Latent Heat of Vaporization:** 154 Btu/lb = 85.8 cal/g = 3.59 10<sup>4</sup> J/kg  
9.13 **Heat of Combustion:** -19,084 Btu/lb = -10,602 cal/g = -443.89 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# 1-UNDECENE

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	47.170	35	0.480	32	1.040	34	1.461
36	47.150	40	0.480	34	1.040	36	1.429
38	47.130	45	0.480	36	1.040	38	1.398
40	47.110	50	0.480	38	1.040	40	1.368
42	47.090	55	0.480	40	1.040	42	1.339
44	47.070	60	0.480	42	1.040	44	1.311
46	47.050	65	0.480	44	1.040	46	1.283
48	47.030	70	0.480	46	1.040	48	1.257
50	47.010	75	0.480	48	1.040	50	1.231
52	46.990	80	0.480	50	1.040	52	1.205
54	46.970	85	0.480	52	1.040	54	1.181
56	46.940	90	0.480	54	1.040	56	1.157
58	46.920	95	0.480	56	1.040	58	1.134
60	46.900	100	0.480	58	1.040	60	1.111
62	46.880	105	0.480	60	1.040	62	1.089
64	46.860	110	0.480	62	1.040	64	1.068
66	46.840	115	0.480	64	1.040	66	1.047
68	46.820	120	0.480	66	1.040	68	1.027
70	46.800			68	1.040	70	1.008
72	46.780			70	1.040	72	0.988
74	46.760			72	1.040	74	0.970
76	46.740			74	1.040	76	0.952
78	46.720			76	1.040	78	0.934
80	46.700					80	0.917
82	46.670					82	0.900
84	46.650					84	0.884

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	80	0.011	80	0.00029	0	0.337
	N	100	0.024	100	0.00062	25	0.352
	S	120	0.051	120	0.00126	50	0.366
	O	140	0.099	140	0.00238	75	0.381
	L	160	0.183	160	0.00425	100	0.395
	U	180	0.322	180	0.00723	125	0.410
	B	200	0.541	200	0.01178	150	0.424
	L	220	0.875	220	0.01849	175	0.438
	E	240	1.365	240	0.02802	200	0.451
		260	2.065	260	0.04121	225	0.465
		280	3.037	280	0.05897	250	0.478
		300	4.354	300	0.08234	275	0.491
		320	6.103	320	0.11240	300	0.504
		340	8.377	340	0.15050	325	0.517
		360	11.280	360	0.19770	350	0.530
		380	14.940	380	0.25550	375	0.542
		400	19.460	400	0.32520	400	0.554
		420	25.000	420	0.40820	425	0.566
		440	31.680	440	0.50580	450	0.578
						475	0.590
						500	0.601
						525	0.613
						550	0.624
						575	0.635
						600	0.646

# UNDECANOL

UND

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Alcohol C-11 (undecylic) Hendecanoic alcohol 1-Hendecanol 1-Undecanol Undecyl alcohol	Solid or liquid  Floats on water.	Colorless	Mild odor
Call fire department. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Extinguish with foam, dry chemical, or carbon dioxide.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to eyes. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment:  
Absorb  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 20; Alcohol, glycol  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_9\text{CH}_2\text{OH}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 103-08-2  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51219

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield.  
3.2 Symptoms Following Exposure: Liquid can irritate eyes.  
3.3 Treatment of Exposure: Wash eyes with water for at least 15 min.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: None  
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 200°F O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Foam, carbon dioxide, or dry chemical  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 78.5 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 23.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 12.1% (theor.), 5 days; 25.3% (theor.), 1 day  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Technical  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: B  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 172.30  
9.3 Boiling Point at 1 atm: 473°F = 245°C = 518°K  
9.4 Freezing Point: 60.6°F = 15.9°C = 289.1°K  
9.5 Critical Temperature: 739.4°F = 393°C = 666.2°K  
9.6 Critical Pressure: 308 psia = 21 atm = 2.1 MN/m<sup>2</sup>  
9.7 Specific Gravity: 0.835 at 20°C (liquid)  
9.8 Liquid Surface Tension: 26.5 dynes/cm = 0.0265 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: (est.) 40 dynes/cm = 0.04 N/m at 20°C  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): 1.032  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: (est.) -18,000 Btu/lb = -10,000 cal/g = -419 X 10<sup>3</sup> J/kg  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# UNDECANOL

UND

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
62	52.330	68	0.487	68	1.109	N O T  P E R T I N E N T	
64	52.260	69	0.487	69	1.109		
66	52.190	70	0.487	70	1.109		
68	52.121	71	0.487	71	1.109		
70	52.050	72	0.487	72	1.109		
72	51.980	73	0.487	73	1.109		
74	51.920	74	0.487	74	1.109		
76	51.850	75	0.487	75	1.109		
78	51.780	76	0.487	76	1.109		
80	51.710	77	0.487	77	1.109		
82	51.640	78	0.487	78	1.109		
84	51.571	79	0.487	79	1.109		
86	51.500	80	0.487	80	1.109		
88	51.430	81	0.487	81	1.109		
90	51.360	82	0.487	82	1.109		
92	51.290	83	0.487	83	1.109		
94	51.220	84	0.487	84	1.109		
		85	0.487	85	1.109		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
I N S O L U B L E		250	0.144	250	0.00326	0	0.332
		260	0.198	260	0.00442	25	0.346
		270	0.269	270	0.00591	50	0.360
		280	0.359	280	0.00779	75	0.374
		290	0.474	290	0.01014	100	0.387
		300	0.617	300	0.01303	125	0.401
		310	0.794	310	0.01656	150	0.415
		320	1.011	320	0.02082	175	0.428
		330	1.275	330	0.02591	200	0.441
		340	1.592	340	0.03195	225	0.454
		350	1.970	350	0.03906	250	0.467
		360	2.418	360	0.04736	275	0.480
		370	2.945	370	0.05697	300	0.492
		380	3.559	380	0.06804	325	0.505
		390	4.272	390	0.08069	350	0.517
		400	5.092	400	0.09508	375	0.529
		410	6.033	410	0.11130	400	0.541
		420	7.105	420	0.12960	425	0.553
		430	8.320	430	0.15010	450	0.565
		440	9.690	440	0.17290	475	0.576
		450	11.230	450	0.19810	500	0.587
		460	12.950	460	0.22600	525	0.599
						550	0.610
						575	0.621
						600	0.631



# UREA PEROXIDE

UPO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carbamide peroxide Carbonyl diamine peroxide Hydrogen peroxide carbamide Percarbamide Urea hydrogen peroxide Urea, hydrogen peroxide salt	Solid  White  Odorless  Mixes with water.
<b>Keep people away.</b> <b>Avoid contact with solid and dust.</b> <b>Shut off ignition sources and call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. May cause fire on contact with combustibles. <b>POISONOUS GASES MAY BE PRODUCED IN FIRE.</b> Containers may explode in fire. Flood discharged area with water. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  <b>SOLID</b> Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** CO(NH<sub>2</sub>)<sub>2</sub>H<sub>2</sub>O<sub>2</sub>  
2.3 **IMO/UN Designation:** 5.1/1511  
2.4 **DOT ID No.:** 1511  
2.5 **CAS Registry No.:** 124-43-6  
2.6 **NAERG Guide No.:** 140  
2.7 **Standard Industrial Trade Classification:** 51219

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves and protective goggles  
3.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose from hydrogen peroxide formed when heated. Contact with eyes causes severe damage. Contact with moist skin causes temporary itching or burning sensation. Ingestion causes irritation of mouth and stomach.  
3.3 **Treatment of Exposure:** INHALATION: remove victim from exposure; call physician. EYES: wash thoroughly with large quantities of water for at least 15 min.; call physician. SKIN: flush with water. INGESTION: give large amounts of water; get medical attention.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (combustible solid; may cause fire upon contact with ordinary combustibles)  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Inert powders (e.g., sand, limestone), water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating ammonia gas may be formed in fire.  
4.6 **Behavior in Fire:** Melts and decomposes, giving off oxygen and ammonia. Increases severity of fire. Containers may explode.  
4.7 **Auto Ignition Temperature:** >680  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Forms solution of hydrogen peroxide (non-hazardous reaction)  
5.2 **Reactivity with Common Materials:** No significant reaction at ordinary temperatures. At 50°C (122°F) reacts with dust and rubbish.  
5.3 **Stability During Transport:** Stable below 60°C (140°F).  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 98-100%  
7.2 **Storage Temperature:** Below 60°C (140°F)  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Oxidizer  
8.2 **49 CFR Class:** 5.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 94.1  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.8 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** -540 Btu/lb = -300 cal/g = -12.5 X 10<sup>3</sup> J/kg  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# UREA PEROXIDE

UPO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	37.870		N O T		N O T		N O T
36	38.630						
38	39.400						
40	40.170						
42	40.930		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	41.700						
46	42.470						
48	43.230						
50	44.000						
52	44.770						
54	45.530						
56	46.300						
58	47.070						
60	47.830						
62	48.600						
64	49.370						
66	50.130						
68	50.900						
70	51.670						
72	52.430						
74	53.200						
76	53.970						
78	54.730						
80	55.500						
82	56.270						
84	57.030						

# URANYL ACETATE

URA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Bis (Acetate) dioxouranium Uranium acetate Uranium acetate dihydrate Uranium oxyacetate dihydrate Uranyl acetate dihydrate	Solid  Yellow  Sinks and mixes slowly with water.  Slight vinegar odor
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{UO}_2(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{H}_2\text{O}$
- 2.3 IMO/IUN Designation: Not listed
- 2.4 DOT ID No.: 9180
- 2.5 CAS Registry No.: 541-09-3
- 2.6 NAERG Guide No.: 162
- 2.7 Standard Industrial Trade Classification: 52511

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved dust respirator; goggles or face shield; protective clothing
- 3.2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Contact with eyes causes irritation.
- 3.3 **Treatment of Exposure:** Get medical attention after all exposures to this compound. INHALATION: move to fresh air. INGESTION: give large amount of water; induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water.
- 3.4 TLV-TWA: 0.2 mg/m<sup>3</sup> (as uranium)
- 3.5 TLV-STEL: 0.6 mg/m<sup>3</sup> (as uranium)
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5-15 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: 10 mg U/m<sup>3</sup>
- 3.14 OSHA PEL-TWA: 0.05 mg/m<sup>3</sup> (as uranium)
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Dissolves and reacts to give a milky solution. The reaction is not hazardous.
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
3.7 ppm/96 hr/fathead minnow/TL<sub>m</sub>/soft water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; Reagent
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Radioactive material
- 8.2 49 CFR Class: 7
- 8.3 49 CFR Package Group: Not pertinent.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 100 pounds
- 8.7 EPA Pollution Category: B
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 424.2
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.89 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# URANYL ACETATE

URA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
62	8.400		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

## UREA

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## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carbamide Carbonyldiamide	Solid crystals or pellets  Sinks and mixes with water.	White	Odorless
Call fire department. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Extinguish with water.		
<b>Exposure</b>	Not harmful.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{NH}_2\text{CONH}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 57-13-6  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51463

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield; dust mask.  
3.2 Symptoms Following Exposure: May irritate eyes.  
3.3 Treatment of Exposure: Wash eyes with water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: None  
3.10 Vapor (Gas) Irritant Characteristics: Non-volatile  
3.11 Liquid or Solid Characteristics: None  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Water  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Melts and decomposes, generating ammonia.  
4.7 Auto Ignition Temperature: Not flammable  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not flammable  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 16.7 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 5.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Occurs only above melting point ( $132^\circ\text{C}$ ), yielding ammonia and other products. The decomposition is not explosive.  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
30,000 mg/l/24 hr/creek chub/all died/fresh water  
16,000 mg/l/24 hr/creek chub/all survived/fresh water  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): 9%, 5 days  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 0/BOD  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Various grades and purities, which depend on manufacturing process and intended use. All have essentially the same hazardous properties.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCL List: Not listed

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 Physical State at  $15^\circ\text{C}$  and 1 atm: Solid  
9.2 Molecular Weight: 60.06  
9.3 Boiling Point at 1 atm: Decomposes  
9.4 Freezing Point:  $271^\circ\text{F} = 133^\circ\text{C} = 406^\circ\text{K}$   
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.34 at  $20^\circ\text{C}$  (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion:  $-3913\text{ Btu/lb} = -2174\text{ cal/g} = -91.02 \times 10^5\text{ J/kg}$   
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution:  $-108\text{ Btu/lb} = -60.1\text{ cal/g} = -2.52 \times 10^5\text{ J/kg}$   
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

NOTES

# UREA

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	69.120		N O T		N O T		N O T
36	71.660						
38	74.209						
40	76.750						
42	79.290		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	81.839						
46	84.379						
48	86.929						
50	89.469						
52	92.020						
54	94.559						
56	97.110						
58	99.650						
60	102.200						
62	104.700						
64	107.299						
66	109.799						
68	112.400						
70	114.900						
72	117.500						
74	120.000						
76	122.500						
78	125.099						
80	127.599						
82	130.199						
84	132.699						

# URANIUM PEROXIDE

URP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Uranium oxide peroxide (UO <sub>2</sub> (O <sub>2</sub> )) Uranium oxide (UO <sub>4</sub> )	Solid crystals      Yellow  Sinks in water.
Keep people away. Avoid contact with solid. Wear goggles, self-contained breathing apparatus, and heavy leather gloves. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Move to fresh air. Keep victim quiet and warm.  SOLID Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: UO<sub>4</sub>·2H<sub>2</sub>O or UO<sub>3</sub>·H<sub>2</sub>O·H<sub>2</sub>O
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52511

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, leather, gloves and protective goggles.
- 3.2 **Symptoms Following Exposure:** INHALATION: Radiation injuries. EYES: Mild irritation. INGESTION: Injury to capillaries, tubular and glomerular nephritis, hepatitis, glycosuria and acidosis.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove from exposure and place on bed rest. EYES: Wash for 15 minutes with running water. Call a physician. SKIN: Wash with soap and water. INGESTION: Excretion is speeded by sodium bicarbonate (10 g in water every hour). Sodium citrate may offer protection to kidneys.
- 3.4 **TLV-TWA:** 0.2 mg/m<sup>3</sup> as Uranium.
- 3.5 **TLV-STEL:** 0.6 mg/m<sup>3</sup> (as uranium)
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Retained in the lungs where it causes radiation injuries, lung cancer may develop. May cause kidney damage.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard, practically harmless to skin.
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** 10 mg U/m<sup>3</sup>
- 3.14 **OSHA PEL-TWA:** 0.05 mg/m<sup>3</sup> (as uranium)
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Decomposes to form U<sub>2</sub>O<sub>7</sub> then to UO<sub>3</sub> and oxygen.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable at ambient temperature.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 338.06
- 9.3 **Boiling Point at 1 atm:** Decomposes
- 9.4 **Freezing Point:** Decomposes 239°F = 115°C = 388.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** Currently not available
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** (Calculated) 11.66
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** (Estimated at >90°C) = 98.0 Btu/lb = 54.45 cal/g = 2.28 X 10<sup>5</sup> J/kg
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# URANIUM PEROXIDE

URP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# URANYL SULFATE

URS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Uranium sulfate Uranium sulfate trihydrate Uranyl sulfate trihydrate	Solid	Yellow	Odorless
Sinks and mixes with water.			
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{UO}_2\text{SO}_4 \cdot 3\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52511

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Approved dust respirator; goggles or face shield; protective clothing
- 3.2 Symptoms Following Exposure: Inhalation of dust may irritate nose and throat. Contact with eyes causes irritation.
- 3.3 Treatment of Exposure: Get medical attention after all exposures to this compound. INGESTION: give large amounts of water; induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water.
- 3.4 TLV-TWA: 0.2 mg/m<sup>3</sup> (as uranium)
- 3.5 TLV-STEL: 0.6 mg/m<sup>3</sup> (as uranium)
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 1; LD<sub>50</sub> = 5-15 g/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 10 mg U/m<sup>3</sup>
- 3.14 OSHA PEL-TWA: 0.05 mg/m<sup>3</sup> (as uranium)
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Currently not available
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 135 ppm/96 hr/fathead minnow/TL<sub>m</sub>/hard water  
2.8 ppm/96 hr/fathead minnow/TL<sub>m</sub>/soft water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial; Pure
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 420.2
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 3.28 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# URANYL SULFATE

URS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	10.480		N O T		N O T		N O T
36	11.250						
38	12.030						
40	12.800						
42	13.570		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	14.340						
46	15.110						
48	15.890						
50	16.660						
52	17.430						
54	18.200						
56	18.980						
58	19.750						
60	20.520						
62	21.290						
64	22.060						
66	22.840						
68	23.610						
70	24.380						
72	25.150						
74	25.930						
76	26.700						
78	27.470						
80	28.240						
82	29.010						
84	29.790						

# VALERALDEHYDE

VAL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Amyl aldehyde n-Butyl formal Pentanal Valeral n-Valeraldehyde Valeric aldehyde	Watery liquid  Colorless  Fruity odor  Floats on water. Flammable, irritating vapor is produced.
<b>Keep people away.</b> <b>Shut off ignition sources and call fire department.</b> <b>Avoid contact with liquid and vapor.</b> <b>Stay upwind and use water spray to "knock down" vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fires. Cool exposed containers with water.
<b>Exposure</b>	VAPOR Irritating to eyes, nose, and throat. Move to fresh air.  LIQUID Irritating to skin and eyes. Flush affected areas with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 19; Aldehyde  
2.2 Formula:  $\text{CH}_3(\text{CH}_2)_4\text{CHO}$   
2.3 IMO/UN Designation: 3.2/2058  
2.4 DOT ID No.: 2058  
2.5 CAS Registry No.: 110-62-3  
2.6 NAERG Guide No.: 129  
2.7 Standard Industrial Trade Classification: 51621

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; rubber gloves and boots.  
3.2 **Symptoms Following Exposure:** Vapor may irritate eyes. Liquid irritates eyes and skin.  
3.3 **Treatment of Exposure:** EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.  
3.4 **TLV-TWA:** 50 ppm  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1;  $\text{LD}_{50}$  = 5 to 15 g/kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 54°F O.C.  
4.2 **Flammable Limits in Air:** 2.1 - 7.8%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 432°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** 1.9 mm/min  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 26% (theor.), 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 98.5+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	2
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 86.13  
9.3 **Boiling Point at 1 atm:** 217.4°F = 103.0°C = 376.2°K  
9.4 **Freezing Point:** -132°F = -91°C = 182°K  
9.5 **Critical Temperature:** 537.8°F = 281°C = 554.2°K  
9.6 **Critical Pressure:** 514 psia = 35 atm = 3.5 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.811 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.072  
9.12 **Latent Heat of Vaporization:** 170 Btu/lb = 93 cal/g =  $3.9 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -15,500 Btu/lb = -8,610 cal/g =  $-360.5 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# VALERALDEHYDE

VAL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
15	52.460	41	0.478	41	1.040	41	0.640
20	52.290	42	0.478	42	1.040	42	0.634
25	52.120	43	0.478	43	1.040	43	0.628
30	51.940	44	0.478	44	1.040	44	0.622
35	51.770	45	0.478	45	1.040	45	0.616
40	51.600	46	0.478	46	1.040	46	0.610
45	51.420	47	0.478	47	1.040	47	0.605
50	51.250	48	0.478	48	1.040	48	0.599
55	51.080	49	0.478	49	1.040	49	0.594
60	50.900	50	0.478	50	1.040	50	0.588
65	50.730	51	0.478	51	1.040	51	0.583
70	50.550	52	0.478	52	1.040	52	0.578
75	50.380	53	0.478	53	1.040	53	0.573
80	50.210	54	0.478	54	1.040	54	0.567
85	50.030	55	0.478	55	1.040	55	0.562
90	49.860	56	0.478	56	1.040	56	0.557
95	49.690	57	0.478	57	1.040	57	0.552
100	49.510	58	0.478	58	1.040	58	0.547
105	49.340	59	0.478	59	1.040	59	0.543
110	49.170	60	0.478	60	1.040	60	0.538
115	48.990	61	0.478	61	1.040	61	0.533
120	48.820	62	0.478	62	1.040	62	0.529
125	48.650	63	0.478	63	1.040	63	0.524
130	48.470	64	0.478	64	1.040	64	0.519
135	48.300	65	0.478	65	1.040	65	0.515
140	48.130	66	0.478	66	1.040	66	0.511

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	1.350	40	0.203	40	0.00326	0	0.310
		50	0.286	50	0.00450	25	0.322
		60	0.395	60	0.00611	50	0.335
		70	0.539	70	0.00816	75	0.347
		80	0.724	80	0.01076	100	0.359
		90	0.959	90	0.01400	125	0.370
		100	1.256	100	0.01801	150	0.382
		110	1.625	110	0.02289	175	0.393
		120	2.081	120	0.02880	200	0.404
		130	2.636	130	0.03587	225	0.415
		140	3.309	140	0.04428	250	0.426
		150	4.116	150	0.05417	275	0.437
		160	5.076	160	0.06573	300	0.448
		170	6.211	170	0.07915	325	0.458
		180	7.543	180	0.09461	350	0.468
		190	9.094	190	0.11230	375	0.478
		200	10.890	200	0.13250	400	0.488
		210	12.960	210	0.15530	425	0.498
		220	15.330	220	0.18100	450	0.508
		230	18.030	230	0.20980	475	0.517
		240	21.090	240	0.24180	500	0.526
		250	24.540	250	0.27740	525	0.535
		260	28.410	260	0.31680	550	0.544
		270	32.750	270	0.36010	575	0.553
		280	37.570	280	0.40750	600	0.562

# VINYL ACETATE

VAM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b>	Watery liquid	Colorless	Pleasant fruity odor
VAM Vinyl A monomer Vyac	Floats on water. Flammable, irritating vapor is produced.		
Evacuate. Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Combat fires from safe distance or protected location. Extinguish with dry chemical, foam, carbon dioxide. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Harmful if swallowed or if spilled on skin. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 13; Vinyl acetate  
2.2 Formula:  $\text{CH}_3\text{COOCH}=\text{CH}_2$   
2.3 IMO/UN Designation: 3.2/1301  
2.4 DOT ID No.: 1301  
2.5 CAS Registry No.: 108-05-4  
2.6 NAERG Guide No.: 129P  
2.7 Standard Industrial Trade Classification: 51372

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved canister or air-supplied mask; goggles or face shield; rubber or plastic gloves.
- 3.2 **Symptoms Following Exposure:** High vapor concentrations cause narcosis. Liquid irritates eyes and may irritate skin.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; give artificial respiration if required. EYES: flush with water for at least 15 min.
- 3.4 TLV-TWA: 10 ppm
- 3.5 TLV-STEL: 15 ppm
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 0.12 ppm
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 23°F O.C. 18°F C.C.
- 4.2 **Flammable Limits in Air:** 2.6%-13.4%
- 4.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires; alcohol foam for large fires.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. May polymerize when heated in a fire and rupture container.
- 4.7 **Auto Ignition Temperature:** 756°F
- 4.8 **Electrical Hazards:** Class I, Group D
- 4.9 **Burning Rate:** 3.8 mm/min.
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 21.4 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 7.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Can occur when in contact with peroxides and strong acids; but only under extreme conditions.
- 5.6 **Inhibitor of Polymerization:** 3-5 ppm or 14-17 ppm hydroquinone. Shipments usually also contain 200 ppm of diphenylamine.

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
18 ppm/96 hr/bluegill/ $\text{TL}_{50}$ /fresh water  
>100 ppm/48 hr/flounder/ $\text{LC}_{50}$ /salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 62% of theoretical in 5 days, freshwater, acclimated seed
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Grade A (Diphenylamine-inhibited): 99.8% Grade H (Hydroquinone-inhibited): 99.8%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** C
- 7.6 **Ship Type:** 3
- 7.7 **Barge Hull Type:** 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid
- 8.2 **49 CFR Class:** 3
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 3              |
| Instability (Yellow)..... | 2              |
- 8.6 **EPA Reportable Quantity:** 5000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 86.09
- 9.3 **Boiling Point at 1 atm:** 163.2°F = 72.9°C = 346.1°K
- 9.4 **Freezing Point:** -135.0°F = -92.8°C = 180.4°K
- 9.5 **Critical Temperature:** 485.6°F = 252°C = 525.2°K
- 9.6 **Critical Pressure:** 617 atm = 42 psia = 4.25 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.934 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** 23.95 dynes/cm = 0.02395 N/m at 20°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.103
- 9.12 **Latent Heat of Vaporization:** 163 Btu/lb = 90.6 cal/g = 3.79 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** -9754 Btu/lb = -5419 cal/g = -226.9 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** -439 Btu/lb = -244 cal/g = -10.2 X 10<sup>5</sup> J/kg
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 3.7 psia

## NOTES

# VINYL ACETATE

VAM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	60.020	0	0.401	0	1.120	40	0.518
40	59.760	5	0.402	10	1.105	50	0.484
45	59.500	10	0.404	20	1.090	60	0.454
50	59.240	15	0.405	30	1.075	70	0.427
55	58.980	20	0.407	40	1.061	80	0.402
60	58.720	25	0.408	50	1.046	90	0.380
65	58.460	30	0.409	60	1.031	100	0.360
70	58.200	35	0.411	70	1.016	110	0.341
75	57.940	40	0.412	80	1.001	120	0.324
80	57.680	45	0.414	90	0.987	130	0.308
85	57.420	50	0.415	100	0.972	140	0.294
90	57.160	55	0.416	110	0.957	150	0.280
95	56.900	60	0.418	120	0.942	160	0.268
100	56.640	65	0.419	130	0.927		
		70	0.420	140	0.913		
		75	0.422	150	0.898		
		80	0.423	160	0.883		
		85	0.425				
		90	0.426				
		95	0.427				
		100	0.429				
		105	0.430				
		110	0.432				
		115	0.433				
		120	0.434				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.300	0	0.197	0	0.00344	0	0.223
		10	0.286	10	0.00489	25	0.232
		20	0.408	20	0.00682	50	0.241
		30	0.571	30	0.00935	75	0.249
		40	0.786	40	0.01261	100	0.258
		50	1.064	50	0.01674	125	0.266
		60	1.421	60	0.02192	150	0.275
		70	1.871	70	0.02833	175	0.283
		80	2.433	80	0.03616	200	0.291
		90	3.128	90	0.04564	225	0.299
		100	3.977	100	0.05699	250	0.307
		110	5.005	110	0.07046	275	0.314
		120	6.239	120	0.08631	300	0.322
		130	7.706	130	0.10480	325	0.330
		140	9.439	140	0.12620	350	0.337
		150	11.470	150	0.15090	375	0.344
		160	13.830	160	0.17900	400	0.351
		170	16.560	170	0.21100	425	0.358
		180	19.700	180	0.24700	450	0.365
		190	23.290	190	0.28750	475	0.372
		200	27.360	200	0.33270	500	0.379
		210	31.970	210	0.38290	525	0.385
		220	37.150	220	0.43840	550	0.392
		230	42.950	230	0.49950	575	0.398
						600	0.404

# VANILLAN BLACK LIQUOR

VBL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> UF oxylignin	Liquid	Brown	Sweet
<b>Wear full impervious protective clothing and approved respirator. Notify local health and pollution control agencies. Protect water intakes.</b>			
<b>Fire</b>	Not flammable. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with materials appropriate to adjacent fire. Use water spray to cool exposed containers.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Corrosive to skin, eyes and respiratory tract. Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, drink lots of water. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 5; Caustics  
2.2 **Formula:** Not pertinent. (Mixture)  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** Not listed.  
2.5 **CAS Registry No.:** 69514-06-7  
2.6 **NAERG Guide No.:** Not listed  
2.7 **Standard Industrial Trade Classification:** 59810

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.
- 3.2 **Symptoms Following Exposure:** Corrosive material. Exposure can cause severe chemical burns, including blindness if the eyes are contacted.
- 3.3 **Treatment of Exposure:** Get medical attention. **INHALATION:** Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. **EYES:** Flush with water for at least 15 min., lifting lids occasionally. Contact lenses should not be worn when working with this chemical. **SKIN:** Remove contaminated clothing and shoes. Wash with soap and water. **INGESTION:** DO NOT INDUCE VOMITING. Dilute by drinking large quantity of water.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Currently not available  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Prolonged exposure may cause dermatitis and permanent scarring.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable.  
4.2 **Flammable Limits in Air:** Not pertinent.  
4.3 **Fire Extinguishing Agents:** Extinguish fire with materials appropriate to adjacent fire.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.  
4.5 **Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as caustic, carbon dioxide and carbon monoxide, may be released in fire.  
4.6 **Behavior in Fire:** Not pertinent.  
4.7 **Auto Ignition Temperature:** Not pertinent.  
4.8 **Electrical Hazards:** Not pertinent.  
4.9 **Burning Rate:** Not pertinent.  
4.10 **Adiabatic Flame Temperature:** Not pertinent.  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Not pertinent.  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** May generate heat.  
5.2 **Reactivity with Common Materials:** Not compatible with aluminum, zinc and tin. Reaction with these can produce hydrogen gas and heat. Contact with acids will produce carbon dioxide and may create alkaline mists.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Dilute acid.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical in varying concentrations of components. Mixture includes sodium carbonate, sodium hydroxide, sodium sulfate, and sodium lignosulfonate.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Open.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** Not pertinent.  
9.3 **Boiling Point at 1 atm:** 225°F = 107°C = 380°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.3  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# VANILLAN BLACK LIQUOR

VBL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E	68	1000.000

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# VINYL CYCLOHEXENE

VCH

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 4-Vinyl-1-cyclohexene	Liquid                      Colorless  Floats on water.
Wear full impervious protective clothing and approved respirator. Restrict access. Avoid contact with liquid and vapor. Shut off ignition sources and call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Flammable. Vapors can flow to distant ignition source and flash back. Wear full protective clothing with self-contained breathing apparatus. Extinguish fire with dry chemical, alcohol foam, carbon dioxide. Use water spray to cool exposed containers.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. Overexposures may have a narcotic effect. Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES, hold eyelids open and flush with plenty of water.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Dilute and disperse

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** Not listed.  
**2.2 Formula:** C<sub>6</sub>H<sub>9</sub>CH=CH<sub>2</sub>  
**2.3 IMO/UN Designation:** Currently not available  
**2.4 DOT ID No.:** Not listed.  
**2.5 CAS Registry No.:** 100-40-3  
**2.6 NAERG Guide No.:** Not listed  
**2.7 Standard Industrial Trade Classification:** 51129

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Full impervious protective clothing, including boots and gloves. Where splashing is possible wear full face shield or chemical safety goggles. Use approved respirator to protect against vapors.  
**3.2 Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat. High concentrations have a narcotic effect.  
**3.3 Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Flush with water.  
**3.4 TLV-TWA:** 0.1 ppm  
**3.5 TLV-STEL:** Not listed.  
**3.6 TLV-Ceiling:** Not listed.  
**3.7 Toxicity by Ingestion:** Grade 2; oral rat LD<sub>50</sub> = 2.563 g/kg  
**3.8 Toxicity by Inhalation:** Currently not available.  
**3.9 Chronic Toxicity:** Currently not available  
**3.10 Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
**3.11 Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
**3.12 Odor Threshold:** Currently not available  
**3.13 IDLH Value:** Not listed.  
**3.14 OSHA PEL-TWA:** Not listed.  
**3.15 OSHA PEL-STEL:** Not listed.  
**3.16 OSHA PEL-Ceiling:** Not listed.  
**3.17 EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:** 61°F C.C.  
**4.2 Flammable Limits in Air:** 1.0 - 5.9%  
**4.3 Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide.  
**4.4 Fire Extinguishing Agents Not to Be Used:** Water.  
**4.5 Special Hazards of Combustion Products:** Irritating vapors and toxic gases, such as carbon dioxide and carbon monoxide, may be formed when involved in fire.  
**4.6 Behavior in Fire:** Vapors can flow along surfaces to distant ignition source and flash back.  
**4.7 Auto Ignition Temperature:** 517°F.  
**4.8 Electrical Hazards:** Not listed.  
**4.9 Burning Rate:** Currently not available  
**4.10 Adiabatic Flame Temperature:** Currently not available  
**4.11 Stoichiometric Air to Fuel Ratio:** 52.4 (calc.)  
**4.12 Flame Temperature:** Currently not available  
**4.13 Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)  
**4.14 Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** No reaction.  
**5.2 Reactivity with Common Materials:** Currently not available  
**5.3 Stability During Transport:** Stable.  
**5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent.  
**5.5 Polymerization:** Currently not available  
**5.6 Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:** Currently not available  
**6.2 Waterfowl Toxicity:** Currently not available  
**6.3 Biological Oxygen Demand (BOD):** Currently not available  
**6.4 Food Chain Concentration Potential:** Currently not available  
**6.5 GESAMP Hazard Profile:**  
 Bioaccumulation: 0  
 Damage to living resources: -  
 Human Oral hazard: 1  
 Human Contact hazard: 0  
 Reduction of amenities: 0

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** 99%; Research grade; technical 95%.  
**7.2 Storage Temperature:** Ambient.  
**7.3 Inert Atmosphere:** No requirement.  
**7.4 Venting:** Not listed.  
**7.5 IMO Pollution Category:** Currently not available  
**7.6 Ship Type:** Currently not available  
**7.7 Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category:** Not listed.  
**8.2 49 CFR Class:** Not pertinent.  
**8.3 49 CFR Package Group:** Not listed.  
**8.4 Marine Pollutant:** No  
**8.5 NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	3
Instability (Yellow).....	2

**8.6 EPA Reportable Quantity:** Not listed.  
**8.7 EPA Pollution Category:** Not listed.  
**8.8 RCRA Waste Number:** Not listed  
**8.9 EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid  
**9.2 Molecular Weight:** 108.18  
**9.3 Boiling Point at 1 atm:** 262.4°F = 128°C = 401°K  
**9.4 Freezing Point:** -164°F = -108.9°C = 164.1°K  
**9.5 Critical Temperature:** Currently not available  
**9.6 Critical Pressure:** Currently not available  
**9.7 Specific Gravity:** 0.8303 @ 20°C  
**9.8 Liquid Surface Tension:** Currently not available  
**9.9 Liquid Water Interfacial Tension:** Currently not available  
**9.10 Vapor (Gas) Specific Gravity:** Currently not available  
**9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available  
**9.12 Latent Heat of Vaporization:** Currently not available  
**9.13 Heat of Combustion:** Currently not available  
**9.14 Heat of Decomposition:** Currently not available  
**9.15 Heat of Solution:** Currently not available  
**9.16 Heat of Polymerization:** Currently not available  
**9.17 Heat of Fusion:** Currently not available  
**9.18 Limiting Value:** Currently not available  
**9.19 Reid Vapor Pressure:** Currently not available

### NOTES

# VINYL CYCLOHEXENE

VCH

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	6.930		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E	77 100	0.197 0.499	77 100	0.00370 0.00898		C U R R E N T L Y  N O T  A V A I L A B L E

# VINYLDENE CHLORIDE

VCI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,1-Dichloroethylene unsym-Dichloroethylene	Watery liquid      Colorless      Sweet odor  Sinks in water. Flammable, irritating vapor is produced. Boiling point is 89°F.
Keep people away. Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Evacuate area in case of large discharge. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE. POISONOUS GAS IS PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Combat fires from safe distance or protected location. Extinguish with dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge Do not burn	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: 35; Vinyl halides 2.2 Formula: CH <sub>2</sub> =CCl <sub>2</sub> 2.3 IMO/UN Designation: 3.1/1303 2.4 DOT ID No.: 1303 2.5 CAS Registry No.: 75-35-4 2.6 NAERG Guide No.: 129P 2.7 Standard Industrial Trade Classification: 51138
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Approved canister or air-supplied mask; goggles or face shield; rubber gloves and boots. 3.2 <b>Symptoms Following Exposure:</b> Vapor can cause dizziness and drunkenness; high levels cause anesthesia. Liquid irritates eyes and skin. 3.3 <b>Treatment of Exposure:</b> INHALATION: if any illness develops, remove person to fresh air promptly, keep warm and quiet, and get medical attention; if breathing stops, start artificial respiration. INGESTION: not likely a problem; no known antidote; treat symptomatically. EYES OR SKIN: flush with plenty of water for at least 15 min; get medical attention for eyes; remove contaminated clothing and wash before reuse. 3.4 TLV-TWA: 5 ppm 3.5 TLV-STEL: 20 ppm 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; Oral LD <sub>50</sub> = 24 hr = 84 mg/kg (adrenalectomized rat) 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 3.11 <b>Liquid or Solid Characteristics:</b> Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** -19°F O.C.  
4.2 **Flammable Limits in Air:** 5.6%-16.0%  
4.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Toxic hydrogen chloride and phosgene are generated in fires.  
4.6 **Behavior in Fire:** May explode in fire due to polymerization. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 1058°F  
4.8 **Electrical Hazards:** I, D  
4.9 **Burning Rate:** 2.7 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 9.5 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 4.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 15.0%

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Copper and aluminum can cause polymerization.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Can occur if exposed to sunlight, air, copper, aluminum, heat.  
5.6 **Inhibitor of Polymerization:** 200 ppm methyl ether of hydroquinone; 0.6-0.8% phenol

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 2  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Padded  
7.4 **Venting:** Pressure-vacuum  
7.5 **IMO Pollution Category:** D  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 2

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** I  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	2

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U078/D029  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 96.95  
9.3 **Boiling Point at 1 atm:** 88.9°F = 31.6°C = 304.8°K  
9.4 **Freezing Point:** -187.6°F = 122.0°C = 151.2°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.21 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 24 dynes/cm = 0.024 N/m at 15°C  
9.9 **Liquid Water Interfacial Tension:** 37 dynes/cm = 0.037 N/m at 22.7°C  
9.10 **Vapor (Gas) Specific Gravity:** 3.3  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** 130 Btu/lb = 72 cal/g = 3.0 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -4860 Btu/lb = -2700 cal/g = -113.0 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** -333 Btu/lb = -185 cal/g = -7.75 X 10<sup>5</sup> J/kg  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 18.3 psia

## NOTES

# VINYLDENE CHLORIDE

VCI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
-20	81.450	0	0.262		N	-20	0.478
-15	81.129	10	0.268		O	-15	0.466
-10	80.799	20	0.273		T	-10	0.455
-5	80.469	30	0.279			-5	0.443
0	80.139	40	0.284		P	0	0.433
5	79.809	50	0.290		E	5	0.423
10	79.480	60	0.295		R	10	0.413
15	79.150	70	0.301		T	15	0.404
20	78.820	80	0.307		I	20	0.395
25	78.490				N	25	0.387
30	78.160				E	30	0.378
35	77.830				N	35	0.371
40	77.500				T	40	0.363
45	77.169					45	0.356
50	76.839					50	0.349
55	76.509					55	0.342
60	76.179					60	0.336
65	75.849					65	0.330
70	75.520					70	0.324
75	75.200					75	0.318
80	74.870					80	0.313
85	74.540					85	0.307

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.500	40	5.115	40	0.09246	100	0.169
		50	6.473	50	0.11470	120	0.172
		60	8.108	60	0.14090	140	0.175
		70	10.060	70	0.17150	160	0.178
		80	12.360	80	0.20590	180	0.181
		90	15.070	90	0.24760	200	0.184
		100	18.220	100	0.29410	220	0.186
		110	21.870	110	0.34670	240	0.189
		120	26.060	120	0.40600	260	0.192
		130	30.850	130	0.47250	280	0.194
		140	36.290	140	0.54650	300	0.197
		150	42.430	150	0.62860	320	0.199
		160	49.340	160	0.71920	340	0.202
		170	57.070	170	0.81860	360	0.204
		180	65.669	180	0.92720	380	0.206
		190	75.209	190	1.04600	400	0.209
		200	85.750	200	1.17400	420	0.211
		210	97.339	210	1.31300	440	0.213
						460	0.215
						480	0.217
						500	0.219
						520	0.221
						540	0.223
						560	0.225
						580	0.227
						600	0.229

# VINYL CHLORIDE

VCM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Chlorethylene VCL VCM Vinyl C monomer	Gas                      Colorless                      Sweet odor  Liquid floats and boils on water. Flammable, irritating visible vapor cloud is produced.
<p>Keep people away.  Evacuate.  Shut off ignition sources and call fire department.  Stay upwind and use water spray to "knock down" vapor.  Evacuate area in case of large discharge.  Avoid contact with liquid and vapor.  Notify local health and pollution control agencies.  Protect water intakes.</p>	
<b>Fire</b>	FLAMMABLE. POISONOUS GAS IS PRODUCED IN FIRE. Flashback along vapor trail may occur. May explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Cool exposed containers and protect men effecting shutoff with water. Stop flow of gas if possible. Let fire burn. Extinguish small fires with dry chemical.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 35; Vinyl halides  
2.2 Formula: CH<sub>2</sub>=CHCl  
2.3 IMO/UN Designation: 2.0/1086  
2.4 DOT ID No.: 1086  
2.5 CAS Registry No.: 75-01-4  
2.6 NAERG Guide No.: 116P  
2.7 Standard Industrial Trade Classification: 51139

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Rubber gloves and shoes; gas-tight goggles; organic vapor canister or self-contained breathing apparatus.  
3.2 **Symptoms Following Exposure:** INHALATION: high concentrations cause dizziness, anesthesia, lung irritation. SKIN: may cause frostbite; phenol inhibitor may be absorbed through skin if large amounts of liquid evaporate.  
3.3 **Treatment of Exposure:** INHALATION: remove patient to fresh air and keep him quiet and warm; call a doctor; give artificial respiration if breathing stops. EYES AND SKIN: flush with plenty of water for at least 15 min.; for eyes, get medical attention; remove contaminated clothing.  
3.4 TLV-TWA: 5 ppm  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Not pertinent  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Chronic exposure may cause liver damage.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. May cause frostbite.  
3.12 **Odor Threshold:** 260 ppm  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: 1 ppm  
3.15 OSHA PEL-STEL: 5 ppm average not exceeding any 15 min.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
-110°F O.C.  
4.2 **Flammable Limits in Air:** 3.6 - 33%  
4.3 **Fire Extinguishing Agents:** For small fires use dry chemical or carbon dioxide. For large fires stop flow of gas. Cool exposed containers with water.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion**  
Products: Forms highly toxic combustion products such as hydrogen chloride, phosgenic, and carbon monoxide.  
4.6 **Behavior in Fire:** Container may explode in fire. Gas is heavier than air and may travel considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 882°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 4.3 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 11.9 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 4.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** N<sub>2</sub> diluent: 10.0-13.4%

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Polymerizes in presence of air, sunlight, or heat unless stabilized by inhibitors.  
5.6 **Inhibitor of Polymerization:** Not normally used except when high temperatures are expected. Then 40-100 ppm of phenol used.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None  
6.2 **Waterfowl Toxicity:** None  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: MA  
Human Oral hazard: MA  
Human Contact hazard: II  
Reduction of amenities: XXX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial or technical 99+%  
7.2 **Storage Temperature:** Under pressure; ambient At atm. pressure; low  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Under pressure; safety relief At atm. pressure; pressure-vacuum  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** 2

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable gas  
8.2 49 CFR Class: 2.1  
8.3 49 CFR Package Group: Not pertinent.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	2

8.6 EPA Reportable Quantity: 1 pound  
8.7 EPA Pollution Category: X  
8.8 RCRA Waste Number: U043/D043  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
9.2 **Molecular Weight:** 62.50  
9.3 **Boiling Point at 1 atm:** 7.2°F = 13.8°C = 259.4°K  
9.4 **Freezing Point:** -244.8°F = -153.8°C = -119.4°K  
9.5 **Critical Temperature:** 317.1°F = 158.4°C = 431.6°K  
9.6 **Critical Pressure:** 775 psia = 52.7 atm = 5.34 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.969 at -13°C (liquid)  
9.8 **Liquid Surface Tension:** 16.0 dynes/cm = 0.0160 N/m at 25°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** 2.2  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.186  
9.12 **Latent Heat of Vaporization:** 160 Btu/lb = 88 cal/g = 3.7 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -8136 Btu/lb = -4520 cal/g = -189.1 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** -729 Btu/lb = -405 cal/g = 16.9 X 10<sup>5</sup> J/kg  
9.17 **Heat of Fusion:** 18.14 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 75 psia

### NOTES

# VINYL CHLORIDE

VCM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0 5	61.000 60.710	-30 -20 -10 0	0.259 0.265 0.272 0.279		N O T  P E R T I N E N T	-10 -5 0 5	0.287 0.291 0.276 0.271

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.600	-50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120	3.384 4.501 5.908 7.658 9.814 12.440 15.610 19.410 23.920 29.220 35.430 42.630 50.940 60.480 71.349 83.669 97.580 113.200	-50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120	0.04810 0.06245 0.08005 0.10140 0.12710 0.15760 0.19360 0.23560 0.28440 0.34050 0.40470 0.47760 0.56000 0.65250 0.75570 0.87050 0.99740 1.13700	0 25 50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600	0.185 0.192 0.198 0.205 0.211 0.217 0.224 0.230 0.235 0.241 0.247 0.252 0.257 0.263 0.268 0.273 0.277 0.282 0.286 0.291 0.295 0.299 0.303 0.307 0.311

# VINYL ETHYL ETHER

VEE

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ether, vinyl ethyl Ethyl vinyl ether Vinamar	Liquid                      Colorless                      Characteristic, disagreeable  Floats on water. Flammable.
Evacuate. Keep people away. Avoid contact with vapor or liquid. Wear goggles, self-contained breathing apparatus, and rubber gloves. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE</b> Flash back along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with alcohol foam, carbon dioxide, dry chemical, foam, or carbon tetrachloride. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	<b>CALL FOR MEDICAL AID.</b>  <b>LIQUID OR VAPOR</b> Irritating to skin and eyes. Harmful if swallowed or inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effects of low concentrations on aquatic life are unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
 Contain  
 Collection Systems: Skim; Pump;  
 Dredge  
 Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
 2.2 Formula: CH<sub>3</sub>CHOC<sub>2</sub>H<sub>5</sub>  
 2.3 IMO/UN Designation: 3.1/1302  
 2.4 DOT ID No.: 1302  
 2.5 CAS Registry No.: 109-92-2  
 2.6 NAERG Guide No.: 127P  
 2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full face mask, self-contained breathing apparatus, eye protection, and rubber gloves.
- 3.2 **Symptoms Following Exposure:** INHALATION OR INGESTION: Excitement followed by unconsciousness and respiratory paralysis. CNS depression. EYES: May cause irritation and transient injury to cornea. SKIN: Prolonged contact can cause tissue defatting and dehydration leading to dermatitis.
- 3.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from contaminated area and administer artificial respiration and oxygen if necessary. EYES: Flush with copious amounts of water. SKIN: Wash with copious amounts of water. INGESTION: Gastric lavage and saline cathartics.
- 3.4 TLV-TWA: Not listed.  
 3.5 TLV-STEL: Not listed.  
 3.6 TLV-Ceiling: Not listed.  
 3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg.  
 3.8 **Toxicity by Inhalation:** Currently not available.  
 3.9 **Chronic Toxicity:** Prolonged contact with skin may cause dermatitis. Possible liver damage may occur with repeated use.  
 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause reddening of skin.  
 3.12 **Odor Threshold:** Currently not available  
 3.13 **IDLH Value:** Not listed.  
 3.14 OSHA PEL-TWA: Not listed.  
 3.15 OSHA PEL-STEL: Not listed.  
 3.16 OSHA PEL-Ceiling: Not listed.  
 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** <-50°F C.C.  
 4.2 **Flammable Limits in Air:** 1.7% - 28%  
 4.3 **Fire Extinguishing Agents:** Alcohol foam, CO<sub>2</sub>, dry chemical or carbon tetrachloride  
 4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective  
 4.5 **Special Hazards of Combustion Products:** Currently not available  
 4.6 **Behavior in Fire:** Explosive hazard  
 4.7 **Auto Ignition Temperature:** 395°F  
 4.8 **Electrical Hazards:** Currently not available  
 4.9 **Burning Rate:** Currently not available  
 4.10 **Adiabatic Flame Temperature:** Currently not available  
 4.11 **Stoichiometric Air to Fuel Ratio:** 26.2 (calc.)  
 4.12 **Flame Temperature:** Currently not available  
 4.13 **Combustion Molar Ratio (Reactant to Product):** 8.0 (calc.)  
 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
 5.2 **Reactivity with Common Materials:** No reaction  
 5.3 **Stability During Transport:** Can react vigorously with oxidizing materials  
 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
 5.5 **Polymerization:** May polymerize.  
 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
 6.2 **Waterfowl Toxicity:** Currently not available  
 6.3 **Biological Oxygen Demand (BOD):** Currently not available  
 6.4 **Food Chain Concentration Potential:** None  
 6.5 **GESAMP Hazard Profile:**  
     Bioaccumulation: 0  
     Damage to living resources: 2  
     Human Oral hazard: 0  
     Human Contact hazard: 0  
     Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
 7.2 **Storage Temperature:** Currently not available  
 7.3 **Inert Atmosphere:** Currently not available  
 7.4 **Venting:** Currently not available  
 7.5 **IMO Pollution Category:** C  
 7.6 **Ship Type:** 2  
 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid  
 8.2 49 CFR Class: 3  
 8.3 49 CFR Package Group: I  
 8.4 Marine Pollutant: No  
 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 2              |
| Flammability (Red).....   | 4              |
| Instability (Yellow)..... | 2              |
- 8.6 EPA Reportable Quantity: Not listed.  
 8.7 EPA Pollution Category: Not listed.  
 8.8 RCRA Waste Number: Not listed  
 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
 9.2 **Molecular Weight:** 72.104  
 9.3 **Boiling Point at 1 atm:** 96°F = 35.6°C = 308.8°K  
 9.4 **Freezing Point:** -175°F = -115°C = 158.2°K  
 9.5 **Critical Temperature:** Currently not available  
 9.6 **Critical Pressure:** Currently not available  
 9.7 **Specific Gravity:** 0.7589 at 20°C  
 9.8 **Liquid Surface Tension:** Currently not available  
 9.9 **Liquid Water Interfacial Tension:** Currently not available  
 9.10 **Vapor (Gas) Specific Gravity:** 2.5  
 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
 9.12 **Latent Heat of Vaporization:** (Estimated) 165 Btu/lb = 91.8 cal/g = 3.84 X 10<sup>5</sup> J/kg  
 9.13 **Heat of Combustion:** -14,326 Btu/lb = -7959 cal/g = -333 X 10<sup>5</sup> J/kg  
 9.14 **Heat of Decomposition:** Currently not available  
 9.15 **Heat of Solution:** Currently not available  
 9.16 **Heat of Polymerization:** Currently not available  
 9.17 **Heat of Fusion:** Currently not available  
 9.18 **Limiting Value:** Currently not available  
 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# VINYL ETHYL ETHER

VEE

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
63	47.592		C		C		C
64	47.546		U		U		U
65	47.502		R		R		R
66	47.459		R		R		R
67	47.417		E		E		E
68	47.376		N		N		N
			T		T		T
			L		L		L
			Y		Y		Y
			N		N		N
			O		O		O
			T		T		T
			A		A		A
			V		V		V
			A		A		A
			I		I		I
			L		L		L
			A		A		A
			B		B		B
			L		L		L
			E		E		E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	35	4.011	35	0.05335		C
	N	40	4.469	40	0.05898		U
	S	45	4.979	45	0.06520		R
	O	50	5.548	50	0.07208		R
	L	55	6.181	55	0.07968		E
	U	60	6.887	60	0.08809		N
	B	65	7.673	65	0.09738		T
	L	70	8.549	70	0.10765		L
	E	75	9.525	75	0.11901		Y
		80	10.613	80	0.13156		N
		85	11.824	85	0.14544		O
		90	13.174	90	0.16078		T
		95	14.678	95	0.17774		A
							V
							A
							I
							L
							A
							B
							L
							E



# VINYL FLUORIDE

VFI

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Fluoroethylene Monofluoroethylene	Gas                      Colorless                      Faint odor  Floats and boils on water. Flammable visible vapor cloud is produced.
Evacuate. Keep people away. Avoid contact with liquid. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Let fire burn. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water.
<b>Exposure</b>	Call for medical aid.  VAPOR If inhaled will cause headache, or dizziness. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.
<b>Water Pollution</b>	Not harmful to aquatic life.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Do not burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: CH<sub>2</sub>=CHF
- 2.3 IMO/UN Designation: 2/1860
- 2.4 DOT ID No.: 1860
- 2.5 CAS Registry No.: 75-02-5
- 2.6 NAERG Guide No.: 116P
- 2.7 Standard Industrial Trade Classification: 51137

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Protective gloves; safety glasses; self-contained breathing apparatus
- 3.2 **Symptoms Following Exposure:** Inhalation of vapor causes slight intoxication, some shortness of breath. Liquid may cause frostbite of eyes or skin.
- 3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air. SKIN: if frostbite has occurred, immerse in warm water, treat burn.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent (gas at normal temperatures)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Currently not available
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not pertinent (flammable compressed liquefied gas)
- 4.2 **Flammable Limits in Air:** 2.6%-21.7%
- 4.3 **Fire Extinguishing Agents:** Let fire burn; shut off flow of gas; cool adjacent containers with water.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic hydrogen fluoride gas is generated in a fire.
- 4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode.
- 4.7 **Auto Ignition Temperature:** 860°F
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** 11.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 4.0 (calc.)
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** In the absence of inhibitor, polymerization can occur.
- 5.6 **Inhibitor of Polymerization:** Terpene B-0.2%

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.9+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2.1
- 8.3 **49 CFR Package Group:** Not pertinent.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	2
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 46.1
- 9.3 **Boiling Point at 1 atm:** -98°F = -72°C = 201°K
- 9.4 **Freezing Point:** -258°F = -161°C = 112°K
- 9.5 **Critical Temperature:** 130.5°F = 54.7°C = 327.9°K
- 9.6 **Critical Pressure:** 760 psia = 51.6 atm = 5.24 MN/m<sup>2</sup>
- 9.7 **Specific Gravity:** 0.707 at 0°C (liquid)
- 9.8 **Liquid Surface Tension:** 5 dynes/cm = 0.005 N/m at 15°C
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 1.6
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.2097
- 9.12 **Latent Heat of Vaporization:** 156 Btu/lb = 86.5 cal/g = 3.62 X 10<sup>5</sup> J/kg
- 9.13 **Heat of Combustion:** (est.) -6,500 Btu/lb = -3,600 cal/g = -150 X 10<sup>5</sup> J/kg
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# VINYL FLUORIDE

VFI

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T	-140 -130 -120 -110 -100	0.816 0.787 0.758 0.730 0.701		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	-100 -95 -90 -85 -80 -75 -70 -65 -60 -55 -50 -45 -40	13.740 15.770 18.030 20.540 23.310 26.380 29.760 33.460 37.520 41.950 46.780 52.020 57.710	-100 -95 -90 -85 -80 -75 -70 -65 -60 -55 -50 -45 -40	0.16410 0.18570 0.20940 0.23540 0.26370 0.29450 0.32800 0.36410 0.40320 0.44520 0.49040 0.53880 0.59050	-60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60 70 80 90 100 110	0.213 0.216 0.218 0.221 0.224 0.227 0.230 0.232 0.235 0.238 0.241 0.244 0.246 0.249 0.252 0.255 0.258 0.260

# VINYL METHYL ETHER

VME

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Methoxyethylene Methyl vinyl ether	Gas  Colorless  Sweet pleasant odor  Floats and may boil on water. Boiling point is 54°F.
Evacuate. Keep people away. Avoid contact with gas. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	<b>FLAMMABLE.</b> Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. DO NOT USE WATER ON FIRE. Let fire burn. Stop flow of gas if possible. Cool exposed containers and protect men effecting shutoff with water.
<b>Exposure</b>	Call for medical aid.  <b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, or loss of consciousness. Move victim to fresh air. If breathing is difficult, give oxygen.  <b>LIQUID</b> Irritating to eyes. Will cause frostbite. Harmful if swallowed. DO NOT RUB AFFECTED AREAS. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_2=\text{CH}-\text{O}-\text{CH}_3$   
2.3 IMO/UN Designation: 2/1087  
2.4 DOT ID No.: 1087  
2.5 CAS Registry No.: 107-25-5  
2.6 NAERG Guide No.: 116P  
2.7 Standard Industrial Trade Classification: 51616

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic-vapor mask; plastic or rubber gloves; safety glasses  
3.2 **Symptoms Following Exposure:** Inhalation causes intoxication, blurring of vision, headache, dizziness, excitation, loss of consciousness. Liquid or concentrated vapor irritates eyes and causes frostbite of skin. Aspiration of the liquid will cause chemical pneumonitis.  
3.3 **Treatment of Exposure:** INHALATION: remove victim to fresh air; if breathing is difficult, administer oxygen; call physician. EYES: wash with copious quantities of water; consult an eye specialist. SKIN: wash with copious quantities of water; treat frostbite by use of warm water or blankets. INGESTION: do NOT induce vomiting, get medical attention.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5$  to 5 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
-69°F O.C.  
4.2 **Flammable Limits in Air:** 2.6%-39%  
4.3 **Fire Extinguishing Agents:** Let fire burn; shut off gas flow; extinguish small fires with dry chemical or carbon dioxide.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Containers may explode. Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 549°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 19.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 6.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly to form acetaldehyde; reaction is not hazardous unless water is hot or acids are present.  
5.2 **Reactivity with Common Materials:** Acids will cause polymerization.  
5.3 **Stability During Transport:** Stable if kept free from acids  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Can polymerize in the presence of acids.  
5.6 **Inhibitor of Polymerization:** Diethylamine; Triethanolamine; Solid potassium hydroxide

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: -  
Human Oral hazard: 1  
Human Contact hazard: 0  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99.7+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Safety relief  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas  
8.2 **49 CFR Class:** 2.1  
8.3 **49 CFR Package Group:** Not pertinent.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	2

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas  
9.2 **Molecular Weight:** 58.1  
9.3 **Boiling Point at 1 atm:** 41.9°F = 5.5°C = 278.7°K  
9.4 **Freezing Point:** -188°F = -122°C = 151°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.777 at 0°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 10 dynes/cm = 0.010 N/m at 0°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 25 dynes/cm = 0.025 N/m at 0°C  
9.10 **Vapor (Gas) Specific Gravity:** 2.0  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.1473  
9.12 **Latent Heat of Vaporization:** (est.) 180 Btu/lb = 100 cal/g = 4.2 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** (est.) -14,200 Btu/lb = -7,900 cal/g = -330 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# VINYL METHYL ETHER

VME

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
10	49.490	16	0.350	16	0.806	16	0.280
15	49.270	18	0.350	18	0.806	18	0.276
20	49.040	20	0.350	20	0.806	20	0.273
25	48.820	22	0.350	22	0.806	22	0.270
30	48.590	24	0.350	24	0.806	24	0.266
35	48.370	26	0.350	26	0.806	26	0.263
40	48.140	28	0.350	28	0.806	28	0.260
		30	0.350	30	0.806	30	0.257
		32	0.350	32	0.806	32	0.254
		34	0.350	34	0.806	34	0.251
		36	0.350	36	0.806	36	0.248
		38	0.350	38	0.806	38	0.245
		40	0.350	40	0.806	40	0.242

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	2.000	40	14.020	40	0.15190	0	0.237
		50	17.230	50	0.18300	20	0.246
		60	21.010	60	0.21880	40	0.254
		70	25.420	70	0.25980	60	0.263
		80	30.540	80	0.30630	80	0.271
		90	36.450	90	0.35900	100	0.280
		100	43.240	100	0.41810	120	0.288
		110	50.970	110	0.48430	140	0.296
		120	59.750	120	0.55790	160	0.304
		130	69.669	130	0.63940	180	0.312
		140	80.809	140	0.72940	200	0.320
		150	93.280	150	0.82810	220	0.328
		160	107.200	160	0.93620	240	0.335
		170	122.599	170	1.05400	260	0.343
		180	139.699	180	1.18200	280	0.350
		190	158.500	190	1.32000	300	0.358
		200	179.099	200	1.47000	320	0.365
		210	201.699	210	1.63000	340	0.372
		220	226.400	220	1.80300	360	0.379
		230	253.199	230	1.98700	380	0.386
		240	282.199	240	2.18300	400	0.393
		250	313.699	250	2.39300	420	0.400
		260	347.699	260	2.61500	440	0.406
		270	384.199	270	2.85000	460	0.413
		280	423.399	280	3.09800	480	0.420
						500	0.426

# VINYL NEODECANOATE

VND

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Neodecanoic acid, vinyl ester VV 10 vinyl monomer	Liquid  Colorless  Pleasant odor  Floats on water.
Keep people away. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible Containers may explode in fire due to polymerization. Extinguish with dry chemical, carbon dioxide, water spray, fog or foam. Cool exposed containers with water.
<b>Exposure</b>	Prolonged or repeated contact of this material with the skin should be avoided.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enter water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 13; Vinyl acetate  
2.2 Formula:  $C_{12}H_{22}O_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 51379

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Currently not available  
3.2 Symptoms Following Exposure: Currently not available  
3.3 Treatment of Exposure: Currently not available  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 1;  $LD_{50} = 23.1 \text{ g/kg}$  (Rat)  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point:  $> 175^{\circ}\text{F}$ . O.C.  
4.2 Flammable Limits in Air: Currently not available  
4.3 Fire Extinguishing Agents: Small fires: dry chemicals,  $\text{CO}_2$ , water spray or alcohol foam. Large fires: water spray, fog or alcohol foam.  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent.  
4.5 Special Hazards of Combustion Products: Currently not available  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature:  $588^{\circ}\text{F}$ .  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: Currently not available  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 78.5 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 33.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction.  
5.2 Reactivity with Common Materials: The monomer is supplied in bulk or resin lined drums, and could be safely stored in tin-lined or stainless steel containers. Storage in plastic or other vessels is not recommended. Copper will inhibit polymerization, and zinc with promote discoloration.  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Commercial application is a modifying monomer in polymerization reactions.  
5.6 Inhibitor of Polymerization: Monomethyl ether of hydroquinone

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: Currently not available  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 0  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Not pertinent. The product is a mixture of compounds.  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: Currently not available  
7.4 Venting: Currently not available  
7.5 IMO Pollution Category: B  
7.6 Ship Type: 3  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at  $15^{\circ}\text{C}$  and 1 atm: Liquid  
9.2 Molecular Weight: 198.3  
9.3 Boiling Point at 1 atm: Currently not available  
9.4 Freezing Point:  $-4^{\circ}\text{F} = -20^{\circ}\text{C} = 253^{\circ}\text{K}$   
9.5 Critical Temperature: Currently not available  
9.6 Critical Pressure: Currently not available  
9.7 Specific Gravity: Currently not available  
9.8 Liquid Surface Tension: Currently not available  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: 11.107 (calc.)  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization:  $106.2 \text{ Btu/lb} = 59 \text{ cal/g} = 2.5 \times 10^5 \text{ J/kg}$   
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Currently not available  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization:  $208.7 \text{ Btu/lb} = 116 \text{ cal/g} = 4.86 \times 10^5 \text{ J/kg}$   
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

NOTES

# VINYL NEODECANOATE

VND

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# VANADIUM OXIDE

VNO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Vanadium (V) oxide Vanadium pentoxide	Solid, granular or flakes Red, brown or grey Odorless
<b>Wear full covering clothing, gloves and approved respirator.</b> <b>Restrict access.</b> <b>Avoid breathing dust or vapor.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable. Heat of fire may produce poisonous fumes of vanadium oxides. Wear full protective clothing with self-contained breathing apparatus. Use extinguishing agents appropriate for the surrounding fire.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST or SOLID Irritating to skin and eyes. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Remove contaminated clothing and shoes. Wash affected areas with soap and water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, give two glasses of water and induce vomiting.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** V<sub>2</sub>O<sub>5</sub>  
2.3 **IMO/UN Designation:** Currently not available  
2.4 **DOT ID No.:** 2862  
2.5 **CAS Registry No.:** 1314-62-1  
2.6 **NAERG Guide No.:** 151  
2.7 **Standard Industrial Trade Classification:** 52269

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Full covering clothing, chemical protective gloves and approved respirator.  
3.2 **Symptoms Following Exposure:** Exposure can cause irritation of eyes, nose and throat. May cause coughing, wheezing, headache, chest pain, metallic taste, tremors, abdominal cramps, vomiting, weakness, breathlessness, or sneezing. A greenish discoloration of the tongue may occur.  
3.3 **Treatment of Exposure:** Get medical attention. INHALATION: Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. EYES: Flush with water for at least 15 min., lifting lids occasionally. SKIN: Remove contaminated clothing and shoes. Wash with soap and water. INGESTION: Give two glasses of water and induce vomiting.  
3.4 **TLV-TWA:** 0.05 mg/m<sup>3</sup> (as respirable dust and fume).  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; oral rat LD<sub>50</sub> > 70 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Repeated or prolonged exposure may cause an allergic skin rash. Poisoning may affect the nervous system, kidneys and lungs.  
3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 35 mg V/m<sup>3</sup> (dust or fume)  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 0.5 mg V/m<sup>3</sup> respirable dust; 0.1 mg V/m<sup>3</sup> fume  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable.  
4.2 **Flammable Limits in Air:** Not pertinent.  
4.3 **Fire Extinguishing Agents:** Use extinguishing agents appropriate for the surrounding fire.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent.  
4.5 **Special Hazards of Combustion**  
Products: Intense heat may release sharp, irritating smoke and poisonous fumes of vanadium oxides.  
4.6 **Behavior in Fire:** Not pertinent.  
4.7 **Auto Ignition Temperature:** Not pertinent.  
4.8 **Electrical Hazards:** Not pertinent.  
4.9 **Burning Rate:** Not pertinent.  
4.10 **Adiabatic Flame Temperature:** Not pertinent.  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Not pertinent.  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction.  
5.2 **Reactivity with Common Materials:** Will form explosive or flammable mixture with a mixture of calcium, sulfur, and moisture. Incompatible with lithium and halogenated compounds such as chlorine trifluoride.  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.  
5.5 **Polymerization:** Will not polymerize.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 4  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical.  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** No requirement.  
7.4 **Venting:** Not listed.  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** P120  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid.  
9.2 **Molecular Weight:** 181.88  
9.3 **Boiling Point at 1 atm:** 3182°F = 1750°C = 2023°K  
9.4 **Freezing Point:** 1216.4°F = 658°C = 931°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 3.34  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent.  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent.  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# VANADIUM OXIDE

VNO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# VINYL TOLUENE

VNT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> p-Methylstyrene	Watery liquid      Colorless      Unpleasant odor  Floats on water.
Avoid contact with liquid. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Containers may explode in fire. Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Skim  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 30; Olefin  
2.2 Formula:  $C_9H_8$   
2.3 IMO/IUN Designation: Not listed  
2.4 DOT ID No.: 2618  
2.5 CAS Registry No.: 25013-15-4  
2.6 NAERG Guide No.: 130P  
2.7 Standard Industrial Trade Classification: 51129

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Air-supplied mask; goggles or face shield; plastic gloves.  
3.2 **Symptoms Following Exposure:** Vapors irritate eyes and nose, high levels cause dizziness, drunkenness, and anesthesia. Liquid irritates eyes and may irritate skin.  
3.3 **Treatment of Exposure:** INHALATION: remove person to fresh air; give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; no known antidote; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.  
3.4 **TLV-TWA:** 50 ppm  
3.5 **TLV-STEL:** 100 ppm  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50}$  = 0.5 to 5 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 50 ppm  
3.13 **IDLH Value:** 400 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 137°F O.C. 125°F C.C.  
4.2 **Flammable Limits in Air:** 0.8%-11%  
4.3 **Fire Extinguishing Agents:** Water fog, foam, carbon dioxide, or dry chemical  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Containers may explode or rupture in a fire due to polymerization.  
4.7 **Auto Ignition Temperature:** 1000°F  
4.8 **Electrical Hazards:** I, D  
4.9 **Burning Rate:** 6.0 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 54.7 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 14.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):**  $N_2$  diluent: 9.0%

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Slow at ordinary temperatures but when hot may rupture container. Also polymerized by metal salts such as those of iron or aluminum.  
5.6 **Inhibitor of Polymerization:** 10-50 ppm tertiary butylcatechol

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** 99.2+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** A  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** 3

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: III  
8.4 Marine Pollutant: Yes  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	2
Instability (Yellow).....	2

8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 118.18  
9.3 **Boiling Point at 1 atm:** 333.9°F = 167.7°C = 440.9°K  
9.4 **Freezing Point:** -106.6°F = -77.0°C = 196.2°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.897 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 31.53 dynes/cm = 0.03153 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 45 dynes/cm = 0.045 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.060  
9.12 **Latent Heat of Vaporization:** 150 Btu/lb = 83.5 cal/g =  $3.50 \times 10^5$  J/kg  
9.13 **Heat of Combustion:** -17.710 Btu/lb = -9840 cal/g =  $412.0 \times 10^5$  J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** -243 Btu/lb = -135 cal/g =  $-5.65 \times 10^5$  J/kg  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.07 psia

### NOTES

# VINYL TOLUENE

VNT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	56.910	35	0.393	41	1.040	35	1.091
40	56.770	40	0.396	42	1.040	40	1.046
45	56.630	45	0.398	43	1.040	45	1.003
50	56.490	50	0.401	44	1.040	50	0.963
55	56.350	55	0.403	45	1.040	55	0.925
60	56.220	60	0.406	46	1.040	60	0.889
65	56.080	65	0.408	47	1.040	65	0.856
70	55.940	70	0.411	48	1.040	70	0.824
75	55.800	75	0.413	49	1.040	75	0.794
80	55.660	80	0.416	50	1.040	80	0.765
85	55.520	85	0.418	51	1.040	85	0.738
90	55.380	90	0.421	52	1.040	90	0.713
95	55.240	95	0.423	53	1.040	95	0.689
100	55.110	100	0.426	54	1.040	100	0.666
105	54.970	105	0.428	55	1.040	105	0.644
110	54.830	110	0.431	56	1.040	110	0.623
115	54.690	115	0.433	57	1.040	115	0.603
120	54.550	120	0.436	58	1.040	120	0.585
125	54.410			59	1.040	125	0.567
130	54.270			60	1.040	130	0.550
135	54.130			61	1.040	135	0.533
140	54.000			62	1.040	140	0.518
				63	1.040		
				64	1.040		
				65	1.040		
				66	1.040		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.009	40	0.007	40	0.00015	85	0.295
		50	0.010	50	0.00023	90	0.295
		60	0.016	60	0.00033	95	0.295
		70	0.023	70	0.00048	100	0.295
		80	0.033	80	0.00068	105	0.295
		90	0.048	90	0.00095	110	0.295
		100	0.067	100	0.00132	115	0.295
		110	0.094	110	0.00182	120	0.295
		120	0.130	120	0.00246	125	0.295
		130	0.177	130	0.00331	130	0.295
		140	0.239	140	0.00439	135	0.295
		150	0.320	150	0.00578	140	0.295
		160	0.424	160	0.00754	145	0.295
		170	0.557	170	0.00975	150	0.295
		180	0.726	180	0.01249	155	0.295
		190	0.938	190	0.01589	160	0.295
		200	1.202	200	0.02006	165	0.295
		210	1.530	210	0.02515	170	0.295
		220	1.932	220	0.03130		
		230	2.425	230	0.03871		
		240	3.023	240	0.04757		

# VANADIUM OXYTRICHLORIDE

VOT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Trichlorooxovanadium Vanadyl chloride Vanadyl trichloride	Liquid  Lemon yellow  Sharp unpleasant odor  Sinks and mixes violently with water.
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR.</b> Wear rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes. Do not add water to undissolved chemical.	
<b>Fire</b>	Not flammable. DO NOT USE WATER ON ADJACENT FIRES.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse dissolved material Stop discharge Chemical and Physical Treatment: Neutralize Do not add water to undissolved material	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $\text{VOCl}_3$ 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 2443 2.5 CAS Registry No.: 7727-18-6 2.6 NAERG Guide No.: 137 2.7 Standard Industrial Trade Classification: 52329
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Acid vapor mask; rubber gloves; face shield; acid-resistant clothing 3.2 <b>Symptoms Following Exposure:</b> Inhalation of vapor causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes severe irritation. 3.3 <b>Treatment of Exposure:</b> Consult a physician after all exposures to this compound. INHALATION: move to fresh air; give artificial respiration if necessary. INGESTION: give large amount of water. EYES: flush with water for 15 min. SKIN: wipe exposed areas free of the chemical with a dry cloth, then flush thoroughly with water. 3.4 TLV-TWA: Not listed. 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; oral rat $\text{LD}_{50}$ = 140 mg/kg 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Repeated exposures may cause discoloration of tongue, loss of appetite, anemia, kidney disorders, and blindness. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 5.9 Currently not available 5.10 10 ppm HCl, based on decomposition of compound in moist air 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 IDLH Value: Not listed. 3.14 OSHA PEL-TWA: Not listed. 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGl: Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water, unless in flooding amounts, should not be used on adjacent fires.
- 4.5 **Special Hazards of Combustion**  
Products: Irritating fumes of hydrogen chloride may form in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts to form a solution of hydrochloric acid
- 5.2 **Reactivity with Common Materials:** In presence of moisture will corrode most metals
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Flush with water and sprinkle with powdered limestone or rinse with dilute solution of sodium bicarbonate or soda ash.
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
See vanadyl sulfate
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: (2)  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 99%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material
- 8.2 49 CFR Class: 8
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 2              |
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid
- 9.2 **Molecular Weight:** 173.3
- 9.3 **Boiling Point at 1 atm:** 259°F = 126°C = 399°K
- 9.4 **Freezing Point:** -107°F = -77°C = 196°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 1.83 at 20°C (liquid)
- 9.8 **Liquid Surface Tension:** Currently not available
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** 5.98
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 **Latent Heat of Vaporization:** Currently not available
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# VANADIUM OXYTRICHLORIDE

VOT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	116.500	0	0.125		N		N
40	116.200	5	0.125		O		O
45	115.900	10	0.125		T		T
50	115.599	15	0.125				
55	115.299	20	0.125		P		P
60	115.000	25	0.125		E		E
65	114.700	30	0.125		R		R
70	114.400	35	0.125		T		T
75	114.000	40	0.125		I		I
80	113.700	45	0.125		N		N
85	113.400	50	0.125		E		E
90	113.099	55	0.125		N		N
95	112.799	60	0.125		T		T
100	112.500	65	0.125				
		70	0.125				
		75	0.125				
		80	0.125				
		85	0.125				
		90	0.125				
		95	0.125				
		100	0.125				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
R E A C T S		60	0.190	60	0.00591		N
		70	0.256	70	0.00780		O
		80	0.340	80	0.01018		T
		90	0.448	90	0.01316		
		100	0.584	100	0.01686		P
		110	0.755	110	0.02140		E
		120	0.967	120	0.02693		R
		130	1.228	130	0.03361		T
		140	1.547	140	0.04163		I
		150	1.933	150	0.05120		N
		160	2.400	160	0.06252		E
		170	2.958	170	0.07585		N
		180	3.623	180	0.09144		T
		190	4.409	190	0.10960		
		200	5.335	200	0.13060		
		210	6.417	210	0.15470		
		220	7.678	220	0.18240		
	230	9.139	230	0.21390			
	240	10.820	240	0.24970			
	250	12.760	250	0.29020			
	260	14.970	260	0.33580			

# VANADIUM PENTOXIDE

VOX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Vanadic anhydride Vanadium pentaoxide	Solid  Yellowish-brown  Odorless  Sinks in water.
<b>Keep people away. Avoid contact with solid and dust.</b> <b>Call fire department.</b> <b>Restrict access.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula: V<sub>2</sub>O<sub>5</sub>  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2862  
2.5 CAS Registry No.: 1314-62-1  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 52269

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Bu. Mines approved respirator; rubber gloves; goggles for prolonged exposure  
3.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat. Ingestion causes severe irritation of mouth and stomach and may be fatal. Contact with eyes or skin causes irritation; eczema may develop.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air; if exposure to dust has been severe, get medical attention. INGESTION: induce vomiting; get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water.  
3.4 **TLV-TWA:** 0.05 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; oral LD<sub>50</sub> = 23 mg/kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Repeated exposures may cause discoloration of tongue, loss of appetite, anemia, kidney disorders, and blindness.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** 35 mg V/m<sup>3</sup> (dust or fume)  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** 0.5 mg V/m<sup>3</sup> dust; 0.1 mg V/m<sup>3</sup> fume  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** May increase intensity of fire when in contact with combustible materials  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
55 ppm/96 hr/fathead minnows/TL<sub>m</sub>/hard water  
13 ppm/96 hr/fathead minnows/TL<sub>m</sub>/soft water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 2  
Human Oral hazard: 4  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 98-99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1,000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** P120  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 181.88  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 3.36 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 85.5 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# VANADIUM PENTOXIDE

VOX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	0.070		N O T		N O T		N O T
36	0.070						
38	0.070						
40	0.070						
42	0.070		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	0.070						
46	0.070						
48	0.070						
50	0.070						
52	0.070						
54	0.070						
56	0.070						
58	0.070						
60	0.070						
62	0.070						
64	0.070						
66	0.070						
68	0.070						
70	0.070						
72	0.070						
74	0.070						
76	0.070						
78	0.070						
80	0.070						
82	0.070						
84	0.070						

# VANADYL SULFATE

VSF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Vanadium oxydisulfate Vanadyl sulfate dihydrate	Solid                      Pale blue                      Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	<p>CALL FOR MEDICAL AID.</p> <p>DUST</p> <p>Irritating to eyes, nose and throat.  If inhaled will cause coughing or difficult breathing.  If in eyes, hold eyelids open and flush with plenty of water.  If breathing has stopped, give artificial respiration.  If breathing is difficult, give oxygen.</p> <p>SOLID</p> <p>Irritating to skin and eyes.  If swallowed will cause nausea or coughing.  Remove contaminated clothing and shoes.  Flush affected areas with plenty of water.  IF IN EYES, hold eyelids open and flush with plenty of water.  IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>
<b>Water Pollution</b>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  May be dangerous if it enters water intakes.  Notify local health and wildlife officials.  Notify operators of nearby water intakes.</p>

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: VOSO<sub>4</sub>·2H<sub>2</sub>O
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 2931
- 2.5 CAS Registry No.: 1344-64-5
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 52349

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves
- 3.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation; eczema may develop. (Result of prolonged exposure are described in section 5.7).
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air; if exposure to dust has been severe, get medical attention. INGESTION: give large amount of water; induce vomiting; get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50-500 mg/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Repeated exposures may cause discoloration of tongue, loss of appetite, anemia, kidney disorders, and blindness.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not listed

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
30 ppm/96 hr/fathead minnow/TL<sub>m</sub>/hard water  
4.8 ppm/96 hr/fathead minnow/TL<sub>m</sub>/soft water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Currently not available
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial; Pure
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison
- 8.2 **49 CFR Class:** 6.1
- 8.3 **49 CFR Package Group:** II
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 199.1
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** (approx.) 2.5 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# VANADYL SULFATE

VSF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	30.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# VINYLTRICHLOROSILANE

VTS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Trichlorovinylsilane Trichlorovinyl silicane Vinyl silicon trichloride	Liquid Colorless to light yellow Sharp choking odor  Reacts violently with water. Irritating gas is produced on contact with water.
Evacuate. Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Notify local health and pollution control agencies. Protect water intakes. Do not add water to undissolved material.	
<b>Fire</b>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE. Cool exposed containers with water.
<b>Exposure</b>	Call for medical aid.  VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse dissolved material  
Do not add water to undissolved material  
Stop discharge  
Chemical and Physical Treatment:  
Neutralize  
Do not burn

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{CH}_2=\text{CHSiCl}_3$   
2.3 IMO/UN Designation: 3.2/1305  
2.4 DOT ID No.: 1305  
2.5 CAS Registry No.: 75-94-5  
2.6 NAERG Guide No.: 155  
2.7 Standard Industrial Trade Classification: 51550

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Acid-vapor-type respiratory protection; rubber gloves; chemical worker's goggles; other protective equipment as necessary to protect skin and eyes.  
3.2 **Symptoms Following Exposure:** Inhalation causes irritation of mucous membranes. Vapor irritates eyes. Contact with liquid causes severe burns of eyes and skin. Ingestion causes burns of mouth and stomach.  
3.3 **Treatment of Exposure:** Get medical attention following all exposures to this compound. INHALATION: remove victim from exposure; give artificial respiration if required. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; give large amount of water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2; oral  $\text{LD}_{50} = 1,280 \text{ mg/kg (rat)}$   
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.  
3.11 **Liquid or Solid Characteristics:** Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.  
3.12 **Odor Threshold:** Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 70°F C.C.  
4.2 Flammable Limits in Air: 3% (LFL)  
4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water, foam  
4.5 Special Hazards of Combustion Products: Toxic chlorine and phosgene gases may be formed in fires.  
4.6 Behavior in Fire: Difficult to extinguish; re-ignition may occur. Contact with water applied to adjacent fires produces irritating hydrogen chloride gas.  
4.7 Auto Ignition Temperature: 505°F  
4.8 Electrical Hazards: Currently not available  
4.9 Burning Rate: 2.9 mm/min.  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: 14.3 (calc.)  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): 6.0 (calc.)  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: Reacts vigorously, evolving hydrogen chloride (hydrochloric acid)  
5.2 Reactivity with Common Materials: Reacts with surface moisture to evolve hydrogen chloride, which will corrode common metals and form flammable hydrogen gas.  
5.3 Stability During Transport: Stable if protected from moisture  
5.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with sodium bicarbonate or lime solution.  
5.5 Polymerization: May occur in absence of inhibitor  
5.6 Inhibitor of Polymerization: Diphenylamine; Hydroquinone

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: (1)  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: 96+%; 98.5+%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Pressure-vacuum  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid  
8.2 49 CFR Class: 3  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	2
Special (White).....	W

8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid  
9.2 Molecular Weight: 161.5  
9.3 Boiling Point at 1 atm: 195.1°F = 90.6°C = 363.8°K  
9.4 Freezing Point: -139°F = -95°C = 178°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 1.26 at 20°C (liquid)  
9.8 Liquid Surface Tension: (est.) 28 dynes/cm = 0.028 N/m at 20°C  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: 5.61  
9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available  
9.12 Latent Heat of Vaporization: 88 Btu/lb = 49 cal/g =  $2.0 \times 10^4 \text{ J/kg}$   
9.13 Heat of Combustion: (est.) -4,300 Btu/lb = -2,400 cal/g =  $-100 \times 10^3 \text{ J/kg}$   
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Currently not available  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# VINYLTRICHLOROSILANE

VTS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	80.139	70	0.200	70	0.887	60	0.687
36	80.070	75	0.200	72	0.887	61	0.684
38	80.000	80	0.200	74	0.887	62	0.680
40	79.929	85	0.200	76	0.887	63	0.676
42	79.870	90	0.200	78	0.887	64	0.673
44	79.799	95	0.200	80	0.887	65	0.669
46	79.730	100	0.200	82	0.887	66	0.666
48	79.660	105	0.200	84	0.887	67	0.662
50	79.589	110	0.200	86	0.887	68	0.659
52	79.520	115	0.200	88	0.887	69	0.656
54	79.450	120	0.200	90	0.887	70	0.652
56	79.379	125	0.200	92	0.887	71	0.649
58	79.309	130	0.200	94	0.887	72	0.646
60	79.240	135	0.200	96	0.887	73	0.642
62	79.169	140	0.200	98	0.887	74	0.639
64	79.099			100	0.887	75	0.636
66	79.030			102	0.887	76	0.633
68	78.959			104	0.887	77	0.629
70	78.889					78	0.626
72	78.830					79	0.623
74	78.759					80	0.620
76	78.690					81	0.617
78	78.620					82	0.614
80	78.549					83	0.611
82	78.480					84	0.608
84	78.410					85	0.605

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R	40	0.459	40	0.01383		N
	E	50	0.612	50	0.01806		O
	A	60	0.806	60	0.02334		T
	C	70	1.051	70	0.02985		
	T	80	1.356	80	0.03781		P
	S	90	1.735	90	0.04748		E
		100	2.199	100	0.05912		R
		110	2.765	110	0.07302		T
		120	3.449	120	0.08951		I
		130	4.269	130	0.10890		N
		140	5.248	140	0.13170		E
		150	6.407	150	0.15810		N
		160	7.772	160	0.18870		T
		170	9.370	170	0.22390		
		180	11.230	180	0.26420		
		190	13.390	190	0.31000		
		200	15.870	200	0.36200		
		210	18.720	210	0.42060		

# WAXES: CARNAUBA

WCA

## CAUTIONARY RESPONSE INFORMATION

Common Synonyms	Solid	Yellow to dark brownish green	Odorless
	Floats on water and solidifies.		
Keep people away. Avoid contact with solid. Call fire department. Notify local health and pollution control agencies.			
Fire	Combustible. Extinguish with foam, water, dry chemical, or carbon dioxide.		
Exposure	LIQUID Will burn skin and eyes. Remove wax. Flush affected areas with plenty of water.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Not pertinent  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: Currently not available  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 33510

### 3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Goggles or face shield; protective gloves and clothing for hot liquid wax.  
3.2 Symptoms Following Exposure: Hot wax can burn skin and eyes.  
3.3 Treatment of Exposure: SKIN OR EYE CONTACT: remove solidified wax from skin, wash with soap and water; if in eyes, or if skin is burned, call a doctor.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Currently not available  
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Not volatile  
3.11 Liquid or Solid Characteristics: Hot wax can burn skin and eyes.  
3.12 Odor Threshold: Odorless  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

4.1 Flash Point: 595°F O.C. 540°F C.C.  
4.2 Flammable Limits in Air: Not pertinent  
4.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide  
4.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing.  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Not pertinent  
4.7 Auto Ignition Temperature: Currently not available  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: No reaction  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): Currently not available  
6.4 Food Chain Concentration Potential: None  
6.5 GESAMP Hazard Profile:  
Bioaccumulation: -  
Damage to living resources: -  
Human Oral hazard: -  
Human Contact hazard: -  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

7.1 Grades of Purity: Shipped in a variety of grades, depending on source of wax and intended use. All have about the same hazardous properties.  
7.2 Storage Temperature: Elevated  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open (flame arrester)  
7.5 IMO Pollution Category: D  
7.6 Ship Type: Data not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Not listed  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: No  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: Not listed.  
8.7 EPA Pollution Category: Not listed.  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: Not pertinent  
9.3 Boiling Point at 1 atm: Very high  
9.4 Freezing Point: 176–187°F = 80–86°C = 353–359°K  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 0.998 at 25°C (solid)  
9.8 Liquid Surface Tension: 32 dynes/cm = 0.032 N/m at 100°C  
9.9 Liquid Water Interfacial Tension: Currently not available  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Currently not available  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Low

### NOTES

# WAXES: CARNAUBA

WCA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
280	48.690	100	0.541	190	1.040	190	4.720
282	48.690	102	0.556	192	1.040	192	4.641
284	48.690	104	0.570	194	1.040	194	4.563
286	48.690	106	0.585	196	1.040	196	4.487
288	48.690	108	0.599	198	1.040	198	4.412
290	48.690	110	0.614	200	1.040	200	4.340
292	48.690	112	0.628	202	1.040	202	4.269
294	48.690	114	0.643	204	1.040	204	4.199
296	48.690	116	0.657	206	1.040	206	4.131
298	48.690	118	0.671	208	1.040	208	4.065
300	48.690	120	0.686	210	1.040	210	4.000
302	48.690	122	0.700	212	1.040	212	3.936
304	48.690	124	0.715	214	1.040	214	3.874
306	48.690	126	0.729	216	1.040	216	3.813
308	48.690	128	0.744	218	1.040	218	3.754
310	48.690	130	0.758	220	1.040	220	3.696
312	48.690	132	0.773	222	1.040	222	3.639
314	48.690	134	0.787	224	1.040	224	3.583
316	48.690	136	0.801				
318	48.690	138	0.816				
320	48.690	140	0.830				
322	48.690	142	0.845				
324	48.690	144	0.859				
326	48.690	146	0.874				
328	48.690	148	0.888				
330	48.690	150	0.903				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T

# WAXES: PARAFFIN

WPF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Petroleum wax		Thick liquid (heated)	Yellow to white	Waxy odor
		Floats on water and solidifies.		
Call fire department. Avoid contact with liquid. Notify local health and pollution control agencies.				
<b>Fire</b>	Combustible. Extinguish with water, foam, dry chemical, or carbon dioxide.			
<b>Exposure</b>	LIQUID Will burn skin and eyes. Remove wax. Flush affected areas with plenty of water.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: Not pertinent  
2.3 IMO/IUN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 8002-74-2  
2.6 NAERG Guide No.: Not listed  
2.7 Standard Industrial Trade Classification: 33510

### 3. HEALTH HAZARDS

3.1 **Personal Protective Equipment:** Goggles or face shield; protective gloves and clothing for hot liquid wax.  
3.2 **Symptoms Following Exposure:** Hot wax can burn eyes and skin.  
3.3 **Treatment of Exposure:** SKIN OR EYE CONTACT: remove solidified wax; wash skin with soap and water; if in eyes, call a doctor.  
3.4 **TLV-TWA:** 2.0 mg/m<sup>3</sup>  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 1; LD<sub>50</sub> = 5 to 15 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** None  
3.10 **Vapor (Gas) Irritant Characteristics:** Non-volatile  
3.11 **Liquid or Solid Characteristics:** None  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

4.1 **Flash Point:** 390°F C.C.  
380–465°F O.C.  
4.2 **Flammable Limits in Air:** Not pertinent  
4.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water or foam may cause frothing.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 473°F  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 0  
Human Oral hazard: 0  
Human Contact hazard: 0  
Reduction of amenities: 0

### 7. SHIPPING INFORMATION

7.1 **Grades of Purity:** Crude-scale; refined  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	1
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** Not pertinent  
9.3 **Boiling Point at 1 atm:** Very high (about 700°F)  
9.4 **Freezing Point:** 118–149°F = 48–65°C = 321–338°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 0.9 at 20°C  
9.8 **Liquid Surface Tension:** 30.6 dynes/cm = 0.0306 N/m at 54°C  
9.9 **Liquid Water Interfacial Tension:** 35–50 dynes/cm = 0.035–0.050 N/m at 54°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** –18,000 Btu/lb = –10,000 cal/g = –430 X 10<sup>3</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Very low

### NOTES

# WAXES: PARAFFIN

WPF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
280	48.690	145	0.607	280	1.040		C
282	48.690	150	0.607	282	1.040		U
284	48.690	155	0.607	284	1.040		R
286	48.690	160	0.607	286	1.040		R
288	48.690	165	0.607	288	1.040		E
290	48.690	170	0.607	290	1.040		N
292	48.690	175	0.607	292	1.040		T
294	48.690	180	0.607	294	1.040		L
296	48.690	185	0.607	296	1.040		Y
298	48.690	190	0.607	298	1.040		
300	48.690	195	0.607	300	1.040		N
302	48.690	200	0.607	302	1.040		O
304	48.690	205	0.607	304	1.040		T
306	48.690	210	0.607	306	1.040		
308	48.690	215	0.607	308	1.040		A
310	48.690	220	0.607	310	1.040		V
312	48.690	225	0.607	312	1.040		A
314	48.690	230	0.607	314	1.040		I
316	48.690	235	0.607	316	1.040		L
318	48.690	240	0.607	318	1.040		A
320	48.690	245	0.607	320	1.040		B
322	48.690	250	0.607	322	1.040		L
324	48.690	255	0.607	324	1.040		E
326	48.690	260	0.607	326	1.040		
328	48.690			328	1.040		
330	48.690			330	1.040		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		N O T  P E R T I N E N T

# WHITE SPIRIT (LOW (15-20%) AROMATIC)

WSL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> SKDN		Liquid	Colorless
<b>Keep people away. Avoid contact with liquid and vapor.</b> Wear self-contained breathing apparatus and protective clothing. Shut off ignition sources and call fire department. Extinguish with dry chemical, alcohol foam or CO <sub>2</sub> . Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Combustible. Flash back along vapor trail may occur. Water may be ineffective on fire. Extinguish with dry chemical, alcohol foam or CO <sub>2</sub> .		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR AND LIQUID May cause narcotic effects at high concentration, irritating eyes and skin, and may induce coughing. If inhaled, move to fresh air and treat symptoms. Flush affected areas with water and soap. IF IN EYES, hold eyelids open and flush with plenty of water.		
<b>Water Pollution</b>	Effect of low concentration on aquatic life is not known. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 33;  
Miscellaneous hydrocarbon mixtures.  
2.2 **Formula:** Not pertinent.  
2.3 **IMO/UN Designation:** 3.3/2319  
2.4 **DOT ID No.:** 2319  
2.5 **CAS Registry No.:** 63394-00-3  
2.6 **NAERG Guide No.:** 128  
2.7 **Standard Industrial Trade Classification:**  
33419

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus.  
3.2 **Symptoms Following Exposure:** At high concentration may cause narcotic effects and defatting of skin. Irritates eyes and skin and may cause induced coughing.  
3.3 **Treatment of Exposure:** INHALATION: Call for medical aid. Take the affected person to fresh air. Treat symptoms. EYES: Flush with plenty of water. SKIN: Take off contaminated clothing and shoes. Wash with plenty of water and soap.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> > 6.0 g/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 104°F C.C.  
4.2 **Flammable Limits in Air:** LEL 0.6% - UEL 6.5%  
4.3 **Fire Extinguishing Agents:** Water spray, alcohol foam, carbon dioxide, dry chemical.  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may not be effective.  
4.5 **Special Hazards of Combustion Products:** Not known.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** 410°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Currently not available  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable.  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent.

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: Z  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient.  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 2  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Currently not available  
9.2 **Molecular Weight:** Currently not available  
9.3 **Boiling Point at 1 atm:** 302-374°F = 150-190°C = 423.2-463.2°K  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 0.780  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# WHITE SPIRIT (LOW (15-20%) AROMATIC)

WSL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	104 140	0.305 0.696		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E



# M-XYLENE

XLM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,3-Dimethylbenzene Xylol	Watery liquid Colorless Sweet odor  Floats on water. Flammable, irritating vapor is produced.
Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 32; Aromatic Hydrocarbon  
2.2 Formula: m-CaH<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub>  
2.3 IMO/UN Designation: 3.2/1307  
2.4 DOT ID No.: 1307  
2.5 CAS Registry No.: 108-38-3  
2.6 NAERG Guide No.: 130  
2.7 Standard Industrial Trade Classification: 51124

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.
- 3.2 **Symptoms Following Exposure:** Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
- 3.4 TLV-TWA: 100 ppm  
3.5 TLV-STEL: 150 ppm  
3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 g/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Kidney and liver damage.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 **Odor Threshold:** 0.05 ppm  
3.13 **IDLH Value:** 900 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 81°F C.C.  
4.2 **Flammable Limits in Air:** 1.1%-7.0%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 982°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 5.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 22 ppm/96 hr/bluegill/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0 lb/lb, 5 days; 0% (theor.), 8 days  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: II  
Reduction of amenities: XX

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research: 99.99%; Pure: 99.9%; Technical: 99.2%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** U239  
8.9 **EPA FWPCL List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 106.16  
9.3 **Boiling Point at 1 atm:** 282°F = 138.9°C = 412.1°K  
9.4 **Freezing Point:** -54.2°F = -47.9°C = 225.3°K  
9.5 **Critical Temperature:** 650.8°F = 343.8°C = 617°K  
9.6 **Critical Pressure:** 513.8 atm = 34.95 psia = 3.540 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.864 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 28.6 dynes/cm = 0.0286 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 36.4 dynes/cm = 0.0364 N/m at 30°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.071  
9.12 **Latent Heat of Vaporization:** 147 Btu/lb = 81.9 cal/g = 3.43 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -17,554 Btu/lb = -9752.4 cal/g = -408.31 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 26.01 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.34 psia

### NOTES

# M-XYLENE

XLM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
15	55.400	40	0.387	35	0.962	15	0.938
20	55.260	50	0.393	40	0.953	20	0.898
25	55.130	60	0.398	45	0.944	25	0.862
30	54.990	70	0.404	50	0.935	30	0.827
35	54.850	80	0.410	55	0.926	35	0.794
40	54.710	90	0.415	60	0.917	40	0.764
45	54.570	100	0.421	65	0.908	45	0.735
50	54.430	110	0.426	70	0.899	50	0.708
55	54.290	120	0.432	75	0.890	55	0.682
60	54.160	130	0.437	80	0.881	60	0.658
65	54.020	140	0.443	85	0.873	65	0.635
70	53.880	150	0.448	90	0.864	70	0.613
75	53.740	160	0.454	95	0.855	75	0.592
80	53.600	170	0.460	100	0.846	80	0.572
85	53.460	180	0.465			85	0.554
90	53.320	190	0.471				
95	53.180	200	0.476				
100	53.050	210	0.482				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	0.090	60	0.00172	0	0.247
	N	70	0.127	70	0.00238	25	0.260
	S	80	0.177	80	0.00324	50	0.273
	O	90	0.242	90	0.00435	75	0.286
	L	100	0.326	100	0.00577	100	0.299
	U	110	0.434	110	0.00754	125	0.311
	B	120	0.571	120	0.00975	150	0.324
	L	130	0.743	130	0.01247	175	0.336
	E	140	0.956	140	0.01577	200	0.348
		150	1.219	150	0.01977	225	0.360
		160	1.538	160	0.02455	250	0.371
		170	1.924	170	0.03023	275	0.383
		180	2.388	180	0.03691	300	0.394
		190	2.939	190	0.04473	325	0.406
		200	3.590	200	0.05382	350	0.417
		210	4.355	210	0.06431	375	0.427
		220	5.247	220	0.07635	400	0.438
		230	6.282	230	0.09009	425	0.449
		240	7.476	240	0.10570	450	0.459
		250	8.846	250	0.12330	475	0.469
		260	10.410	260	0.14310	500	0.479
						525	0.489
						550	0.499
						575	0.508
						600	0.517

# O-XYLENE

XLO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,2-Dimethylbenzene Xylol	Watery liquid  Colorless  Sweet odor  Floats on water. Flammable, irritating vapor is produced.
Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** 32; Aromatic Hydrocarbon  
2.2 **Formula:** o-C<sub>8</sub>H<sub>8</sub>(CH<sub>3</sub>)<sub>2</sub>  
2.3 **IMO/UN Designation:** 3.2/1307  
2.4 **DOT ID No.:** 1307  
2.5 **CAS Registry No.:** 95-47-6  
2.6 **NAERG Guide No.:** 130  
2.7 **Standard Industrial Trade Classification:** 51124

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.  
3.2 **Symptoms Following Exposure:** Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur.  
3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.  
3.4 **TLV-TWA:** 100 ppm  
3.5 **TLV-STEL:** 150 ppm  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Kidney and liver damage.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.05 ppm  
3.13 **IDLH Value:** 900 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 90°F C.C.  
4.2 **Flammable Limits in Air:** 0.9 - 6.7%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 869°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 5.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** >100 mg/l/96 hr/D. magna/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0 lb/lb. 5 days; 2.5% (theor.), 8 days  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research: 99.99%; Pure: 99.7%; Commercial: 95+%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No reaction  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** U239  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 106.16  
9.3 **Boiling Point at 1 atm:** 291.9°F = 144.4°C = 417.6°K  
9.4 **Freezing Point:** -13.3°F = -25.2°C = 248.0°K  
9.5 **Critical Temperature:** 674.8°F = 357.1°C = 630.3°K  
9.6 **Critical Pressure:** 541.5 atm = 36.84 psia = 3.732 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.880 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 30.53 dynes/cm = 0.03053 N/m at 15.5°C  
9.9 **Liquid Water Interfacial Tension:** 36.06 dynes/cm = 0.03606 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.068  
9.12 **Latent Heat of Vaporization:** 149 Btu/lb = 82.9 cal/g = 3.47 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -17,558 Btu/lb = -9754.7 cal/g = -408.41 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 30.64 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.28 psia

### NOTES

# O-XYLENE

XLO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
15	56.460	35	0.389	35	1.043	15	1.328
20	56.330	40	0.391	40	1.035	20	1.263
25	56.190	45	0.394	45	1.027	25	1.202
30	56.050	50	0.396	50	1.018	30	1.145
35	55.910	55	0.398	55	1.010	35	1.092
40	55.770	60	0.400	60	1.002	40	1.042
45	55.630	65	0.402	65	0.993	45	0.995
50	55.490	70	0.404	70	0.985	50	0.952
55	55.360	75	0.406	75	0.977	55	0.911
60	55.220	80	0.408	80	0.969	60	0.873
65	55.080	85	0.411	85	0.960	65	0.836
70	54.940	90	0.413	90	0.952	70	0.802
75	54.800	95	0.415	95	0.944	75	0.770
80	54.660	100	0.417	100	0.935	80	0.740
85	54.520					85	0.712
90	54.380						
95	54.250						
100	54.110						

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	0.071	60	0.00135	0	0.261
	N	70	0.101	70	0.00188	25	0.274
	S	80	0.141	80	0.00258	50	0.287
	O	90	0.194	90	0.00349	75	0.299
	L	100	0.263	100	0.00464	100	0.311
	U	110	0.352	110	0.00611	125	0.323
	B	120	0.465	120	0.00794	150	0.335
	L	130	0.609	130	0.01021	175	0.347
	E	140	0.787	140	0.01298	200	0.358
		150	1.007	150	0.01634	225	0.370
		160	1.277	160	0.02038	250	0.381
		170	1.605	170	0.02520	275	0.392
		180	1.999	180	0.03090	300	0.403
		190	2.469	190	0.03759	325	0.414
		200	3.028	200	0.04539	350	0.424
		210	3.686	210	0.05443	375	0.435
		220	4.456	220	0.06484	400	0.445
		230	5.352	230	0.07674	425	0.455
		240	6.389	240	0.09030	450	0.465
		250	7.581	250	0.10560	475	0.475
		260	8.947	260	0.12290	500	0.485
						525	0.494
						550	0.504
						575	0.513
						600	0.522

# P-XYLENE

XLP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> 1,4-Dimethylbenzene Xylol			
Watery liquid	Colorless	Sweet odor	
Floats on water. Flammable, irritating vapor is produced. Freezing point is 56°F.			
Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim  
Chemical and Physical Treatment: Burn  
Clean shore line  
Salvage waterfowl

### 2. CHEMICAL DESIGNATIONS

2.1 **CG Compatibility Group:** 32; Aromatic Hydrocarbon  
2.2 **Formula:** p-C<sub>6</sub>H<sub>4</sub>(CH<sub>3</sub>)<sub>2</sub>  
2.3 **IMO/UN Designation:** 3.2/1307  
2.4 **DOT ID No.:** 1307  
2.5 **CAS Registry No.:** 106-42-3  
2.6 **NAERG Guide No.:** 130  
2.7 **Standard Industrial Trade Classification:** 51124

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.
- 3.2 **Symptoms Following Exposure:** Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur.
- 3.3 **Treatment of Exposure:** INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
- 3.4 **TLV-TWA:** 100 ppm  
3.5 **TLV-STEL:** 150 ppm  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Kidney and liver damage.  
3.10 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.  
3.11 **Liquid or Solid Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.  
3.12 **Odor Threshold:** 0.05 ppm  
3.13 **IDLH Value:** 900 ppm  
3.14 **OSHA PEL-TWA:** 100 ppm  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** 81°F C.C.  
4.2 **Flammable Limits in Air:** 1.1%-7.0%  
4.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.  
4.7 **Auto Ignition Temperature:** 984°F  
4.8 **Electrical Hazards:** Class I, Group D  
4.9 **Burning Rate:** 5.8 mm/min.  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 50.0 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 22 ppm/96 hr/bluegill/TL<sub>m</sub>/fresh water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 0 lb/lb in 5 days  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 1  
Human Contact hazard: 1  
Reduction of amenities: X

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research: 99.99%; Pure: 99.8%; Technical: 99.0%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester) or pressure-vacuum  
7.5 **IMO Pollution Category:** C  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable liquid  
8.2 **49 CFR Class:** 3  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:**  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	3
Instability (Yellow).....	0

  
8.6 **EPA Reportable Quantity:** 100 pounds  
8.7 **EPA Pollution Category:** B  
8.8 **RCRA Waste Number:** U239  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Liquid  
9.2 **Molecular Weight:** 106.16  
9.3 **Boiling Point at 1 atm:** 280.9°F = 138.3°C = 411.5°K  
9.4 **Freezing Point:** 55.9°F = 13.3°C = 286.5°K  
9.5 **Critical Temperature:** 649.4°F = 343.0°C = 616.2°K  
9.6 **Critical Pressure:** 509.4 atm = 34.65 psia = 3.510 MN/m<sup>2</sup>  
9.7 **Specific Gravity:** 0.861 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** 28.3 dynes/cm = 0.0283 N/m at 20°C  
9.9 **Liquid Water Interfacial Tension:** 37.8 dynes/cm = 0.0378 N/m at 20°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.071  
9.12 **Latent Heat of Vaporization:** 150 Btu/lb = 81 cal/g = 3.4 X 10<sup>5</sup> J/kg  
9.13 **Heat of Combustion:** -17,559 Btu/lb = -9754.7 cal/g = -408.41 X 10<sup>5</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** 37.83 cal/g  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** 0.34 psia

### NOTES

# P-XYLENE

XLP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	53.970	60	0.412	60	0.935	60	0.678
65	53.850	70	0.418	65	0.928	65	0.654
70	53.690	80	0.424	70	0.921	70	0.631
75	53.550	90	0.429	75	0.914	75	0.610
80	53.410	100	0.435	80	0.907	80	0.590
85	53.270	110	0.440	85	0.900	85	0.571
90	53.140	120	0.446	90	0.892	90	0.552
95	53.000	130	0.451	95	0.885	95	0.535
100	52.860	140	0.457	100	0.878	100	0.519
105	52.720	150	0.462			105	0.503
110	52.580	160	0.468			110	0.488
115	52.440	170	0.474			115	0.474
120	52.300	180	0.479			120	0.460
		190	0.485				
		200	0.490				
		210	0.496				
		220	0.501				
		230	0.507				
		240	0.512				
		250	0.518				
		260	0.524				
		270	0.529				
		280	0.535				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	0.096	60	0.00183	0	0.246
	N	70	0.135	70	0.00252	25	0.259
	S	80	0.187	80	0.00343	50	0.272
	O	90	0.255	90	0.00459	75	0.285
	L	100	0.343	100	0.00607	100	0.297
	U	110	0.456	110	0.00792	125	0.309
	B	120	0.599	120	0.01022	150	0.321
	L	130	0.777	130	0.01303	175	0.333
	E	140	0.998	140	0.01646	200	0.345
		150	1.270	150	0.02059	225	0.357
		160	1.600	160	0.02553	250	0.368
		170	1.998	170	0.03138	275	0.380
		180	2.475	180	0.03826	300	0.391
		190	3.041	190	0.04629	325	0.402
		200	3.710	200	0.05561	350	0.413
		210	4.493	210	0.06636	375	0.424
		220	5.407	220	0.07867	400	0.435
		230	6.465	230	0.09270	425	0.445
		240	7.683	240	0.10860	450	0.456
		250	9.080	250	0.12650	475	0.466
		260	10.670	260	0.14670	500	0.476
						525	0.486
						550	0.496
						575	0.505
						600	0.515

## XYLENOL

XYL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cresylic acid Dimethylphenol 2-Hydroxy-m-xylene 2,6-Xylenol	Solid or liquid  Light yellowish brown  Sweet tarry odor  May float or sink in water.
<b>Keep people away.</b> <b>Avoid contact with solid and liquid.</b> <b>Call fire department.</b> <b>Notify local health and pollution control agencies.</b> <b>Protect water intakes.</b>	
<b>Fire</b>	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.
<b>Exposure</b>	Call for medical aid. DUST Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID Irritating to skin and eyes. If swallowed or skin is exposed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Skim; Pump;  
Dredge  
Chemical and Physical Treatment:  
Absorb  
Clean shore line

## 2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.  
2.2 Formula: 2, 6-(CH<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>4</sub>OH  
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2261  
2.5 CAS Registry No.: 576-26-1  
2.6 NAERG Guide No.: 153  
2.7 Standard Industrial Trade Classification: 51243

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Organic canister mask; goggles or face shield; rubber gloves; other protective clothing to prevent contact with skin.
- 3.2 **Symptoms Following Exposure:** Vapor irritates eyes, nose, and throat and is readily absorbed through mucous membranes and lungs, producing general toxic symptoms (weakness, dizziness, headache, difficult breathing, twitching). Contact with skin causes temporary pricking and intense burning, then local anesthesia. Affected areas initially show white discoloration, wrinkling, and softening, then become red, then brown or black (signs of gangrene). Extensive burns may permit absorption of chemical to produce toxic symptoms described above. Ingestion causes irritation of mouth and stomach, nausea, abdominal pain, weakness, dizziness, headache, difficult breathing, and twitching.
- 3.3 **Treatment of Exposure:** Get medical attention at once following exposure to this compound.  
INHALATION: remove patient immediately to fresh air. Irritation of nose or throat may be somewhat relieved by spraying or gargling with water until all odor is gone; 100% oxygen inhalation is indicated for cyanosis or respiratory distress; keep patient warm, but not hot. EYES: flood with running water for 15 min.; if physician is not immediately available, continue irrigation for another 15 min.; 2-3 drops of 0.5% pontocaine or equivalent may be instilled after first 15 min.; do not use oils or oily ointments unless ordered by physician. SKIN: wash affected areas with large quantities of water or soapy water until all odor is gone; then wash with alcohol or 20% glycerin solution and more water; keep patient warm, but not hot; cover chemical burns continuously with compresses wet with saturated solution of sodium thiosulfate; apply no salves or ointments for 24 hrs after injury. INGESTION: give large quantities of liquid (salt water, weak sodium bicarbonate solution, milk, or gruel) followed by demulcent such as raw egg white or corn starch paste; if profuse vomiting does not follow immediately, give a mild emetic (such as 1 tbsp. mustard in glass of water), or tickle back of throat. Repeat procedure until vomitus is free of the odor. Some demulcent should be left in stomach after vomiting. Keep patient comfortably warm.
- 3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2; oral LD<sub>50</sub> = 1,070 mg/kg (mouse)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Damage to heart muscle, and changes in liver, kidney, and spleen in rats  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 163°F C.C.  
4.2 **Flammable Limits in Air:** 1.4% (LFL)  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic vapors of unburned material may form in fire.  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** 1110°F  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 47.6 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 13.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
(2, 6 isomer) 7-9 ppm\*/trout/lethal/fresh water  
\*Time period not specified.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 31% of theoretical in 5 days  
6.4 **Food Chain Concentration Potential:** None  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: T  
Damage to living resources: 2  
Human Oral hazard: 2  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 99% 2, 6-Xylenol. Other commercial Xylenols include 2, 3-; 2, 4-; 2, 5-; 3, 4-; 3, 5-; and various mixtures of these. Properties are similar to those of the 2, 6-compound.  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 2              |
| Instability (Yellow)..... | 0              |
- 8.6 **EPA Reportable Quantity:** 1,000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid or liquid  
9.2 **Molecular Weight:** 122.2  
9.3 **Boiling Point at 1 atm:** 413°F = 212°C = 485°K  
9.4 **Freezing Point:** -40 to +106°F = -40 to +45°C = 233 to 318°K  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.01 at 20°C (liquid)  
9.8 **Liquid Surface Tension:** (est.) 30 dynes/cm = 0.030 N/m at 30°C  
9.9 **Liquid Water Interfacial Tension:** (est.) 25 dynes/cm = 0.025 N/m at 25°C  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** 212.74 Btu/lb = 118.19 cal/g = 4.9451 X 10<sup>5</sup> J/kg at 25°C  
9.13 **Heat of Combustion:** -15,310 Btu/lb = -8,500 cal/g = -356 X 10<sup>6</sup> J/kg  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# XYLENOL

XYL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
60	63.460	60	0.456	60	0.967	160	1.845
70	63.180	61	0.456	61	0.967	165	1.744
80	62.900	62	0.457	62	0.967	170	1.650
90	62.620	63	0.457	63	0.967	175	1.562
100	62.350	64	0.458	64	0.967	180	1.480
110	62.070	65	0.458	65	0.967	185	1.403
120	61.790	66	0.459	66	0.967	190	1.332
130	61.510	67	0.459	67	0.967	195	1.265
140	61.240	68	0.460	68	0.967	200	1.203
150	60.960	69	0.461	69	0.967	205	1.144
160	60.680	70	0.461	70	0.967	210	1.089
170	60.400	71	0.462	71	0.967	215	1.038
180	60.130	72	0.462	72	0.967	220	0.989
190	59.850	73	0.463	73	0.967	225	0.944
200	59.570	74	0.463	74	0.967	230	0.901
210	59.290	75	0.464	75	0.967	235	0.861
		76	0.464	76	0.967	240	0.823
		77	0.465	77	0.967	245	0.787
		78	0.466	78	0.967		
		79	0.466	79	0.967		
		80	0.467	80	0.967		
		81	0.467	81	0.967		
		82	0.468	82	0.967		
		83	0.468	83	0.967		
		84	0.469	84	0.967		
		85	0.469	85	0.967		

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	0.200	220	0.345	220	0.00577		N
		230	0.441	230	0.00727		O
		240	0.559	240	0.00910		T
		250	0.705	250	0.01131		
		260	0.883	260	0.01397		P
		270	1.099	270	0.01715		E
		280	1.360	280	0.02093		R
		290	1.674	290	0.02542		T
		300	2.048	300	0.03070		I
		310	2.494	310	0.03688		N
		320	3.021	320	0.04410		E
		330	3.641	330	0.05249		N
		340	4.368	340	0.06218		T
		350	5.217	350	0.07335		
		360	6.205	360	0.08617		
		370	7.348	370	0.10080		
		380	8.667	380	0.11750		
		390	10.180	390	0.13640		
		400	11.920	400	0.15780		
		410	13.900	410	0.18200		
		420	16.160	420	0.20910		



# ZINC AMMONIUM CHLORIDE

ZAC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Ammonium pentachlorozincate Ammonium zinc chloride		Solid	White	Odorless
		Sinks and mixes with water.		
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Not flammable.			
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{ZnCl}_2 \cdot 3\text{NH}_4\text{Cl}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 9154
- 2.5 CAS Registry No.: 52628-25-8
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; protective gloves
- 3.2 Symptoms Following Exposure: Inhalation of dust irritates nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract. Contact with eyes or skin causes irritation.
- 3.3 Treatment of Exposure: INHALATION: remove from exposure; begin artificial respiration if breathing has ceased. INGESTION: induce vomiting, followed by prompt and complete gastric lavage, catharsis, and demulcents. EYES: flush with water for at least 15 min. SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5\text{-}5 \text{ g/kg}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: Zinc accumulates in some organisms but is not considered to be bioconcentrative.
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: ORM-E
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 296.8
- 9.3 Boiling Point at 1 atm: (sublimes) 644°F = 340°C = 613°K
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.81 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ZINC AMMONIUM CHLORIDE

ZAC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ZINC ARSENATE

ZAR

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid                      Colorless                      Odorless

Sinks in water.

**KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID AND DUST.**  
Wear goggles and dust respirator.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
POISONOUS IF INHALED.  
Irritating to eyes, nose and throat.  
Move victim to fresh air.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing is difficult, give oxygen.

SOLID  
POISONOUS IF SWALLOWED.  
Irritating to skin and eyes.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: (approx.)  $Zn_3(AsO_4)_2 \cdot H_2O$
- 2.3 IMO/UN Designation: 6.1/1712
- 2.4 DOT ID No.: 1712
- 2.5 CAS Registry No.: 1303-39-5
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 52389

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; rubber gloves
- 3.2 Symptoms Following Exposure: Dust may irritate eyes. Ingestion or excessive inhalation of dust causes burning of mouth, abdominal pain, vomiting, diarrhea with hemorrhage, dehydration, jaundice, and collapse.
- 3.3 Treatment of Exposure: EYES: flush with water to remove dust. INGESTION: immediately induce evacuation of intestinal tract by inducing vomiting and giving gastric lavage and saline cathartic; see physician at once; consider development of arsenic poisoning.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: May be carcinogenic. Arsenic poisoning may develop.
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile:
  - Bioaccumulation: 0
  - Damage to living resources: 3
  - Human Oral hazard: 3
  - Human Contact hazard: -
  - Reduction of amenities: -
- 7.1 Grades of Purity: Technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available
- 8. HAZARD CLASSIFICATIONS
  - 8.1 49 CFR Category: Poison
  - 8.2 49 CFR Class: 6.1
  - 8.3 49 CFR Package Group: II
  - 8.4 Marine Pollutant: No
  - 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	0
  - 8.6 EPA Reportable Quantity: Not listed.
  - 8.7 EPA Pollution Category: Not listed.
  - 8.8 RCRA Waste Number: Not listed
  - 8.9 EPA FWPCA List: Not listed
- 9. PHYSICAL & CHEMICAL PROPERTIES
  - 9.1 Physical State at 15° C and 1 atm: Solid
  - 9.2 Molecular Weight: 866 (approx.)
  - 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
  - 9.4 Freezing Point: Not pertinent
  - 9.5 Critical Temperature: Not pertinent
  - 9.6 Critical Pressure: Not pertinent
  - 9.7 Specific Gravity: 3.31 at 15°C (solid)
  - 9.8 Liquid Surface Tension: Not pertinent
  - 9.9 Liquid Water Interfacial Tension: Not pertinent
  - 9.10 Vapor (Gas) Specific Gravity: Not pertinent
  - 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
  - 9.12 Latent Heat of Vaporization: Not pertinent
  - 9.13 Heat of Combustion: Not pertinent
  - 9.14 Heat of Decomposition: Not pertinent
  - 9.15 Heat of Solution: Not pertinent
  - 9.16 Heat of Polymerization: Not pertinent
  - 9.17 Heat of Fusion: Currently not available
  - 9.18 Limiting Value: Currently not available
  - 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# ZINC ARSENATE

ZAR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ZINC BICHROMATE

ZBC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Zinc dichromate	Solid, crystals powder    Reddish-brown Orange-yellow  Mixes with water.
Keep people away. Avoid contact with solid and dust. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. May cause fire on contact with combustibles. Flood discharge area with water. Cool exposed containers with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose, and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Will burn skin and eyes. If swallowed can cause dizziness, nausea, convulsions, and coma. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Contain  
Collection Systems: Pump; Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $ZnCr_2O_7 \cdot 3H_2O$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52431

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Rubber gloves, face shield or goggles, approved dust mask.
- 3.2 Symptoms Following Exposure: INHALATION: Corrosive to mucous membranes continuous exposure may lead to perforation of nasal septum. EYES: Conjunctivitis and lacrimation. SKIN: Corrosive producing deep penetrating ulcers to exposed area. Slow to heal. INGESTION: Has a harsh metallic taste. May cause vertigo, thirst, abdominal pain, vomiting, shock, convulsions and coma.
- 3.3 Treatment of Exposure: Call a physician. INHALATION: Remove from exposure. EYES: Wash with running water. SKIN: Wash with copious amounts of water. INGESTION: Gastric lavage, induce vomiting, catharsis. Give milk or starch drinks to relieve irritation.
- 3.4 TLV-TWA: 0.01 mg/m<sup>3</sup> as Cr.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg.
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Carcinogenic-chromates have carcinogenic potential.
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Causes smarting of the skin and first-degree burns on short-exposure; may cause second-degree burns on long exposure.
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: 0.1 mg/m<sup>3</sup> as CrO<sub>3</sub>
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not flammable
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Not flammable
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Hygroscopic
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
96-hour TL<sub>50</sub> Bluegills = 1.9 to 4.2 mg/l as zinc in soft water  
96-hour TL<sub>50</sub> Bluegills in hard water = 10.1 to 12.9 mg  
96-hour TL<sub>50</sub> Mosquito fish = 56 to 135 mg/l as Cr
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): 62.4 mg/l Zn will cause a 50% drop in the five day BOD.
- 6.4 Food Chain Concentration Potential: Rainbow trout can accumulate Cr from water containing as little as 10<sup>-6</sup> g/l. Zn can accumulate in some organisms.
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available
- 7.2 Storage Temperature: Currently not available
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	1
Special (White).....	OX
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 335.45
- 9.3 Boiling Point at 1 atm: Currently not available
- 9.4 Freezing Point: Currently not available
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: Currently not available
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: 11.57 (calculated)
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ZINC BICHROMATE

ZBC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	S O L U B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# ZINC BORATE

ZBO

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid White Odorless

Sinks in water.

Keep people away. Avoid contact with solid and dust.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

SOLID  
Irritating to skin and eyes.  
If swallowed will cause nausea and vomiting.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula: (approx.)  $2\text{ZnO} \cdot 3\text{B}_2\text{O}_3 \cdot 3.5\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 1332-07-6
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52384

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; protective gloves
- 3.2 Symptoms Following Exposure: Inhalation of dust may irritate nose and throat. Ingestion can cause gastrointestinal disturbances, convulsions, central nervous depressions, skin eruptions, shock, and death. Contact with eyes or skin causes irritation.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: administer gastric lavage with warm tap water; saline catharsis; consult physician. EYES or SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 1;  $\text{LD}_{50}$  = 5-15 g/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: Zinc accumulates in some organisms but is not considered to be bioconcentrative.
- 6.5 GESAMP Hazard Profile: Not listed

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial grades contain 45-52% zinc oxide, 29-35% boric anhydride
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 434.75
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.7 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# ZINC BORATE

ZBO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# ZINC BROMIDE

ZBR

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid White Odorless

Sinks and mixes with water.

Keep people away. Avoid contact with solid and dust.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
Irritating to eyes, nose and throat.  
If inhaled will cause coughing or difficult breathing.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

SOLID  
Irritating to skin and eyes.  
If swallowed will cause nausea and vomiting.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{ZnBr}_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 9156  
2.5 CAS Registry No.: 7699-45-8  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Chemical goggles or face shield; rubber gloves; dust mask  
3.2 Symptoms Following Exposure: Inhalation of dust may irritate nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract; if large amount is swallowed and not thrown up, drowsiness and other symptoms of bromide poisoning may occur. Contact with eyes or skin causes irritation.  
3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water; induce vomiting, followed by prompt and complete gastric lavage, catharsis, and demulcents. EYES or SKIN: wash immediately with large volumes of water.  
3.4 TLV-TWA: Not listed.  
3.5 TLV-STEL: Not listed.  
3.6 TLV-Ceiling: Not listed.  
3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5\text{-}5\text{ g/kg}$   
3.8 Toxicity by Inhalation: Currently not available.  
3.9 Chronic Toxicity: Currently not available  
3.10 Vapor (Gas) Irritant Characteristics: Currently not available  
3.11 Liquid or Solid Characteristics: Currently not available  
3.12 Odor Threshold: Currently not available  
3.13 IDLH Value: Not listed.  
3.14 OSHA PEL-TWA: Not listed.  
3.15 OSHA PEL-STEL: Not listed.  
3.16 OSHA PEL-Ceiling: Not listed.  
3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable  
4.2 Flammable Limits in Air: Not flammable  
4.3 Fire Extinguishing Agents: Not pertinent  
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent  
4.5 Special Hazards of Combustion Products: Not pertinent  
4.6 Behavior in Fire: Currently not available  
4.7 Auto Ignition Temperature: Not pertinent  
4.8 Electrical Hazards: Not pertinent  
4.9 Burning Rate: Not pertinent  
4.10 Adiabatic Flame Temperature: Currently not available  
4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.  
4.12 Flame Temperature: Currently not available  
4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.  
4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction  
5.2 Reactivity with Common Materials: Currently not available  
5.3 Stability During Transport: Stable  
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent  
5.5 Polymerization: Not pertinent  
5.6 Inhibitor of Polymerization: Not listed

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available  
6.2 Waterfowl Toxicity: Currently not available  
6.3 Biological Oxygen Demand (BOD): None  
6.4 Food Chain Concentration Potential: Zinc accumulates in some organisms, but is not considered to be bioconcentrative.  
6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical, 98+%  
7.2 Storage Temperature: Ambient  
7.3 Inert Atmosphere: No requirement  
7.4 Venting: Open  
7.5 IMO Pollution Category: Currently not available  
7.6 Ship Type: Currently not available  
7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.  
8.2 49 CFR Class: Not pertinent  
8.3 49 CFR Package Group: Not listed.  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification: Not listed  
8.6 EPA Reportable Quantity: 1000 pounds  
8.7 EPA Pollution Category: C  
8.8 RCRA Waste Number: Not listed  
8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid  
9.2 Molecular Weight: 225.18  
9.3 Boiling Point at 1 atm: Not pertinent (decomposes)  
9.4 Freezing Point: Not pertinent  
9.5 Critical Temperature: Not pertinent  
9.6 Critical Pressure: Not pertinent  
9.7 Specific Gravity: 4.22 at 20°C (solid)  
9.8 Liquid Surface Tension: Not pertinent  
9.9 Liquid Water Interfacial Tension: Not pertinent  
9.10 Vapor (Gas) Specific Gravity: Not pertinent  
9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
9.12 Latent Heat of Vaporization: Not pertinent  
9.13 Heat of Combustion: Not pertinent  
9.14 Heat of Decomposition: Not pertinent  
9.15 Heat of Solution: Not pertinent  
9.16 Heat of Polymerization: Not pertinent  
9.17 Heat of Fusion: Currently not available  
9.18 Limiting Value: Currently not available  
9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ZINC BROMIDE

ZBR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	341.399		N O T		N O T		N O T
36	347.899						
38	354.299						
40	360.799						
42	367.199		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	373.699						
46	380.099						
48	386.500						
50	393.000						
52	399.399						
54	405.899						
56	412.299						
58	418.799						
60	425.199						
62	431.699						
64	438.099						
66	444.500						
68	451.000						
70	457.399						
72	463.899						
74	470.299						
76	476.799						
78	483.199						
80	489.699						
82	496.099						
84	502.500						

# ZIRCONIUM ACETATE

ZCA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Zirconium acetate solution	Liquid  White  Weak vinegar odor  Sinks and mixes with water.
Keep people away. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $Zr(C_2H_3O_2)_4 \cdot H_2O$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed.
- 2.7 Standard Industrial Trade Classification: 51371

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Rubber gloves; chemical goggles or face shield
- 3.2 Symptoms Following Exposure: Has only a mild pharmacological action. Contact with eyes or skin may cause irritation.
- 3.3 Treatment of Exposure: INGESTION: Give large amount of water. EYES: Flush with water for at least 15 min.; consult a physician if irritation persists. SKIN: Flush with water.
- 3.4 TLV-TWA: 5 mg/m<sup>3</sup> (as zirconium)
- 3.5 TLV-STEL: 10 mg/m<sup>3</sup> (as zirconium)
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5-5 g/kg (rat)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 50 mg/m<sup>3</sup> (as zirconium)
- 3.14 OSHA PEL-TWA: 5 mg/m<sup>3</sup> (as zirconium)
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 25% solution in water
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 327 (solute only)
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.37 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ZIRCONIUM ACETATE

ZCA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	85.520		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ZINC CARBONATE

ZCB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Calamine Smithsonite	Solid, crystalline powder  White  Odorless  Sinks in water.
Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID If swallowed, may cause nausea and vomiting. IF SWALLOWED and victim is CONSCIOUS, have victim drinkwater or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $ZnCO_3$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 9157
- 2.5 CAS Registry No.: 3486-35-9
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52379

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Currently not available
- 3.2 Symptoms Following Exposure: INHALATION OF DUST OR FUMES: Dry throat, cough and chest discomfort. Fever and sweating. SKIN: Astringent. INGESTION: May cause nausea and vomiting.
- 3.3 Treatment of Exposure: Call a physician. INGESTION: Dilute with water or milk and remove by gastric lavage. To relieve irritation administer demulcents.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Currently not available
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Could decompose to liberate  $CO_2$
- 4.7 Auto Ignition Temperature: Not flammable
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Not flammable
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Currently not available
- 5.5 Polymerization: Will not occur
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity:  
96-hour  $TL_50$  Bluegill sunfish =1.9 to 4.2 mg/l as Zn in soft water  
96-hour  $TL_50$  Bluegill sunfish =10.1 to 12.9 mg/l as Zn in hard water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): 62.4 mg/l Zn will cause a 50% drop in the five day BOD.
- 6.4 Food Chain Concentration Potential: Little accumulation
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 70% (as  $ZnO$ )
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 125.4
- 9.3 Boiling Point at 1 atm: Not pertinent
- 9.4 Freezing Point: Loses  $CO_2$  at 572°F = 300°C = 573.2°K
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 4.398 at room temperature
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ZINC CARBONATE

ZCB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ZINC CHLORIDE

ZCL

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid White solid Odorless

Solid sinks and mixes with water.

Keep people away.  
Avoid contact with solid and solution.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.

### Exposure

CALL FOR MEDICAL AID.

#### SOLID OR SOLUTION

Irritating to skin and eyes.  
If swallowed, will cause nausea or vomiting.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge  
Chemical and Physical Treatment:  
Absorb

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $ZnCl_2$
- 2.3 IMO/UN Designation: 8.0/1840
- 2.4 DOT ID No.: 2331
- 2.5 CAS Registry No.: 7646-85-7
- 2.6 NAERG Guide No.: 154
- 2.7 Standard Industrial Trade Classification: 52329

## 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Goggles or face shield.
- 3.2 Symptoms Following Exposure: Solid or water solution is astringent and can irritate the eyes. When ingested, can cause intoxication, severe irritation of stomach, nausea, vomiting, and diarrhea.
- 3.3 Treatment of Exposure: INGESTION: give large volumes of water and induce vomiting; repeat process; call a doctor. EYES: wash with water for at least 15 min.
- 3.4 TLV-TWA: 1 mg/m<sup>3</sup> (fume)
- 3.5 TLV-STEL: 2 mg/m<sup>3</sup> (fume)
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 50 to 500 mg/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Non-volatile
- 3.11 Liquid or Solid Characteristics: Solid irritates skin on prolonged contact.
- 3.12 Odor Threshold: Odorless
- 3.13 IDLH Value: 50 mg/m<sup>3</sup> (fume)
- 3.14 OSHA PEL-TWA: 1 mg/m<sup>3</sup> (fume)
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Not pertinent
- 4.7 Auto Ignition Temperature: Not flammable
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not flammable
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

## 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 7.2 ppm/96 hr/medium bluegill/TL<sub>50</sub>/fresh water  
28 ppm/48 hr/zebrafish/TL<sub>50</sub>/salt water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 2  
Human Contact hazard: 0  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent; USP; technical; 50% solution in water
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material
- 8.2 49 CFR Class: 8
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	0
Instability (Yellow).....	0
- 8.6 EPA Reportable Quantity: 1,000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 136.28
- 9.3 Boiling Point at 1 atm: Very high
- 9.4 Freezing Point: 541°F = 283°C = 556°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.91 at 25°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: 40.6 cal/g
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## NOTES

# ZINC CHLORIDE

ZCL

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	346.799		N		N		N
36	351.699		O		O		O
38	356.599		T		T		T
40	361.500						
42	366.299		P		P		P
44	371.199		E		E		E
46	376.099		R		R		R
48	381.000		T		T		T
50	385.799		I		I		I
52	390.699		N		N		N
54	395.599		E		E		E
56	400.500		N		N		N
58	405.399		T		T		T
60	410.199						
62	415.099						
64	420.000						
66	424.899						
68	429.699						
70	434.599						
72	439.500						
74	444.399						
76	449.299						
78	454.099						
80	459.000						
82	463.899						
84	468.799						



# ZINC CYANIDE

ZCN

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Cyanide of zinc Zinc dicyanide	Solid-powder      Greyish white to white      Odorless  Sinks in water.
Keep people away. AVOID CONTACT WITH SOLID. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $Zn(CN)_2$ 2.3 IMO/UN Designation: 6.1/1713 2.4 DOT ID No.: 1713 2.5 CAS Registry No.: 557-21-1 2.6 NAERG Guide No.: 151 2.7 Standard Industrial Trade Classification: 52381
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Approved dust respirator, air or oxygen mask in emergencies, chemical safety goggles, dry cotton gloves for handling solids and rubber gloves for solutions, hard hat or brimmed felt hat, rubber or leather safety shoes, long sleeved shirt. 3.2 <b>Symptoms Following Exposure:</b> EYES: Causes eye burns. SKIN: Irritation. INGESTION OR INHALATION: A bitter, acid burning taste is sometimes noted followed by a feeling of constriction or numbness in the throat. Salivation and nausea are not unusual, but vomiting is rare. Anxiety, confusion, vertigo, giddiness and often a sensation of stiffness in the lower jaw. Hypernea and dyspnea. Rapid respiration, then slow and irregular. Unconsciousness, convulsions, death from respiratory arrest. 3.3 <b>Treatment of Exposure:</b> Call a physician. INHALATION: Remove to well-ventilated place. Remove contaminated clothing. Keep patient quiet and warm. Administer by inhalation amyl nitrate for 15 seconds. Repeat about five times at 15-second intervals. Repeat procedure three or four times at 5-minute intervals. If breathing stops apply artificial respiration. When breathing starts use amyl nitrate. EYES: Flush with plenty of water for 15 minutes. SKIN: Remove clothing. Wash with soap and water. INGESTION: Induce vomiting and give 1% sodium thiosulfate solution. Then proceed with treatment as described for inhalation. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> 5 mg/m <sup>3</sup> as cyanide. 3.7 <b>Toxicity by Ingestion:</b> Grade 4; LD <sub>50</sub> below 50 mg/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Chronic exposure may cause headache, lack of appetite, weakness and inflammation of the skin with small pimples or blistery spots. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Not pertinent 3.11 <b>Liquid or Solid Characteristics:</b> Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure. 3.12 <b>Odor Threshold:</b> Odorless 3.13 <b>IDLH Value:</b> 25 mg/m <sup>3</sup> as cyanide 3.14 <b>OSHA PEL-TWA:</b> 5 mg/m <sup>3</sup> as cyanide 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Not pertinent  
4.7 **Auto Ignition Temperature:** Not flammable  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Not flammable  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Contact with acids or acid salts will liberate highly toxic and flammable hydrogen cyanide gas.  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Hypochlorite solution to destroy the cyanide.  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Toxic to fish in range 0.05 to 10 ppm (as Cn). Toxicity increases with acidity, temperature, low oxygen tensions and Zn content.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 62.4 mg/l Zn will cause a 50% drop in five day BOD.  
6.4 **Food Chain Concentration Potential:** Zn may accumulate slightly.  
6.5 **GESAMP Hazard Profile:** Bioaccumulation: 0  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: 1  
Reduction of amenities: 0

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 55% Zn 40% Cn  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Poison  
8.2 49 CFR Class: 6.1  
8.3 49 CFR Package Group: I  
8.4 Marine Pollutant: Yes  
8.5 NFPA Hazard Classification:  

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	1

  
8.6 EPA Reportable Quantity: 10 pounds  
8.7 EPA Pollution Category: A  
8.8 RCRA Waste Number: P121  
8.9 EPA FWPCA List: Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 117.42  
9.3 **Boiling Point at 1 atm:** Not pertinent  
9.4 **Freezing Point:** Decomposes at 800°C  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 1.85 at room temperature  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# ZINC CYANIDE

ZCN

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ZIRCONIUM OXYCHLORIDE

ZCO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Basic zirconium chloride Zirconium oxide chloride Zirconium oxychloride hydrate Zirconyl chloride	Solid  White to yellow  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $ZrOCl_2 \cdot 8H_2O$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 7699-43-6
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52329

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Safety glasses or face shield; protective gloves; dust mask
- 3.2 Symptoms Following Exposure: Has only a mild pharmacological action. Inhalation of dust may irritate nose and throat. Contact with eyes or skin causes irritation.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water. EYES or SKIN: flush with water.
- 3.4 TLV-TWA: 5 mg/m<sup>3</sup> (as zirconium)
- 3.5 TLV-STEL: 10 mg/m<sup>3</sup> (as zirconium)
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; oral LD<sub>50</sub> = 3.5 g/kg (rat)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 50 mg/m<sup>3</sup> (as zirconium)
- 3.14 OSHA PEL-TWA: 5 mg/m<sup>3</sup> (as zirconium)
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 240 ppm/96 hr/fathead minnow/TL<sub>m</sub>/hard water  
18 ppm/96 hr/fathead minnow/TL<sub>m</sub>/soft water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical; Pure
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 322.3
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: >1 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ZIRCONIUM OXYCHLORIDE

ZCO

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ZINC CHROMATE

ZCR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Buttercup yellow Zinc chromate (VI) hydroxide Zinc yellow	Solid  Yellow  Odorless  Sinks in water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{ZnCrO}_4 \cdot 7\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: 1328-67-2
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52431

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Suitable respirator (for dust); rubber gloves; chemical goggles or face shield
- 3.2 **Symptoms Following Exposure:** Inhalation of dust causes irritation of nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract, circulatory collapse, and toxic nephritis. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air; if exposure has been severe, get medical attention. INGESTION: induce vomiting, followed by prompt and complete gastric lavage, catharsis, and demulcents. EYES: flush with water. SKIN: wash thoroughly with soap and water.
- 3.4 **TLV-TWA:** 0.01 mg/m<sup>3</sup>
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; LD<sub>50</sub> = 0.5-5 g/kg
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Possible lung cancer.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** 0.1 mg/m<sup>3</sup> as CrO<sub>3</sub>
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Both chromium and zinc are concentrated by some organisms but are not considered to be bioconcentrative in a spill situation.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Commercial, 100%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 874 (approx.)
- 9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 9.4 **Freezing Point:** Not pertinent
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 3.43 at 20°C (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ZINC CHROMATE

ZCR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	0.100		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ZIRCONIUM SULFATE

ZCS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Disulfatozirconic acid Zirconium sulfate tetrahydrate		Solid	White	Odorless
		Sinks and mixes with water.		
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Not flammable.			
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous to water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $Zr(SO_4)_2 \cdot 4H_2O$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 9163
- 2.5 CAS Registry No.: 14644-61-2
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52349

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; protective gloves.
- 3.2 Symptoms Following Exposure: Has only a mild pharmacological action. Inhalation of dust may irritate nose and throat. Contact with eyes or skin causes irritation.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water. EYES or SKIN: flush with water.
- 3.4 TLV-TWA: 5 mg/m<sup>3</sup> (as zirconium)
- 3.5 TLV-STEL: 10 mg/m<sup>3</sup> (as zirconium)
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; oral LD<sub>50</sub> = 3.5 g/kg (rat)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 50 mg/m<sup>3</sup> (as zirconium)
- 3.14 OSHA PEL-TWA: 5 mg/m<sup>3</sup> (as zirconium)
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 14 ppm as Zr/96 hr/fathead minnow/TL<sub>m</sub>/soft water  
145 ppm/96 hr/fathead minnow/TL<sub>m</sub>/hard water
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Corrosive material
- 8.2 49 CFR Class: 8
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 5000 pounds
- 8.7 EPA Pollution Category: D
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 355.4
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: (approx.) 3.0 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ZIRCONIUM SULFATE

ZCS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	70.950		N		N		N
36	71.309		O		O		O
38	71.669		T		T		T
40	72.020						
42	72.379		P		P		P
44	72.730		E		E		E
46	73.089		R		R		R
48	73.440		T		T		T
50	73.799		I		I		I
52	74.150		N		N		N
54	74.509		E		E		E
56	74.870		N		N		N
58	75.219		E		E		E
60	75.580		N		N		N
62	75.929		T		T		T
64	76.290						
66	76.639						
68	77.000						
70	77.349						
72	77.709						
74	78.070						
76	78.419						
78	78.780						
80	79.129						
82	79.490						
84	79.839						



# ZIRCONIUM TETRACHLORIDE

ZCT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Tetrachlorozirconium Zirconium chloride Zirconium tetrachloride solid (DOT)		Solid crystals      White
		Sinks and decomposes in water. Irritating vapor is produced.
Keep people away. AVOID CONTACT WITH SOLID AND SOLUTION. Wear chemical protective suit with self-contained breathing apparatus. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Not flammable. POISONOUS GAS PRODUCED ON CONTACT WITH WATER Wear chemical protective suit with self-contained breathing apparatus. DO NOT USE WATER ON ADJACENT FIRES. Extinguish adjacent fires with carbon dioxide or dry chemical.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  VAPOR Irritating to eyes, nose, and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritation to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
<b>Water Pollution</b>	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Chemical and Physical Treatment: Neutralize	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: ZrCl <sub>4</sub> 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 2503 2.5 CAS Registry No.: 10026-11-6 2.6 NAERG Guide No.: 137 2.7 Standard Industrial Trade Classification: 52329
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Helmet, self-contained breathing apparatus, rubber boots, gloves, bands around legs, arms and waist. Facemask as well as covering rest of head. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Irritating to upper respiratory tract; presumably caused by liberated HCl. EYES: Irritating. SKIN: Irritating. INGESTION: Burning pain in the mouth and throat, vomiting, watery or bloody diarrhea, retching, collapse, and convulsions. 3.3 <b>Treatment of Exposure:</b> Call a physician. INHALATION: Remove from exposure. EYES: Flush with water. SKIN: Wash with soap and plenty of water. INGESTION: Dilute with water or milk. Give milk of magnesia. 3.4 <b>TLV-TWA:</b> 5 mg/m <sup>3</sup> (as zirconium) 3.5 <b>TLV-STEL:</b> 10 mg/m <sup>3</sup> (as zirconium) 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5 to 5.0 g/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> May cause granuloma in skin. A mild lung irritant. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Vapors of HCl given off cause severe irritation of eyes and throat and can cause lung injury. They cannot be tolerated even at low concentrations. 3.11 <b>Liquid or Solid Characteristics:</b> Fairly severe skin irritant, may cause pain and second-degree burns after a few minutes contact. 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 50 mg/m <sup>3</sup> (as zirconium) 3.14 <b>OSHA PEL-TWA:</b> 5 mg/m <sup>3</sup> (as zirconium) 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Water
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Will not burn - sublimates above 626°F (331°C). May give off HCl fumes.
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts vigorously forming HCl.
- 5.2 **Reactivity with Common Materials:** If moist will form hydrochloric acid which is corrosive to many metals.
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Cautics:** Sodium bicarbonate and ammonia.
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
In water ZrCl<sub>4</sub> decomposes forming ZrOCl<sub>2</sub> and HCl. Using Fathead minnows the 96-hour TL<sub>m</sub> for ZrOCl<sub>2</sub> as Zr in soft water is 18 mg/l, and in hard water 240 mg/l. The 96-hour TL<sub>m</sub> for Mosquito fish in fresh water is 282 mg/l HCl.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** Currently not available
- 6.4 **Food Chain Concentration Potential:** Currently not available
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 1  
Human Oral hazard: 1  
Human Contact hazard: I  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Cool
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Corrosive material
- 8.2 **49 CFR Class:** 8
- 8.3 **49 CFR Package Group:** III
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**
- | Category                  | Classification |
|---------------------------|----------------|
| Health Hazard (Blue)..... | 3              |
| Flammability (Red).....   | 0              |
| Instability (Yellow)..... | 2              |
| Special (White).....      | W              |
- 8.6 **EPA Reportable Quantity:** 5,000 pounds
- 8.7 **EPA Pollution Category:** D
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 233.05
- 9.3 **Boiling Point at 1 atm:** Sublimes 627.8°F = 331°C = 604.2°K
- 9.4 **Freezing Point:** None, except under pressure, since it sublimates.
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 2.083 at 15°C
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** (sublimation) 195.3 btu/lb = 108.5 cal/g at 311°C = 4.54 X 10<sup>3</sup> J/kg
- 9.13 **Heat of Combustion:** Currently not available
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# ZIRCONIUM TETRACHLORIDE

ZCT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	R E A C T S	374	0.019		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# ZINC DIALKYLDITHIOPHOSPHATE

ZDP

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Zinc O,O-di-n-butylphosphorodithioate Zinc dihexyldithiophosphate Zinc dihexylphosphorodithioate	Solid or liquid  Straw yellow to green  Sweet, alcohol-like odor  Sinks in water.
Keep people away. Avoid contact with liquid and solid. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Combustible. Irritating gases may be produced when heated. Extinguish with water, dry chemicals, foam, or carbon dioxide.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  LIQUID OR SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Stop discharge Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: [(RO) <sub>2</sub> PSS] <sub>2</sub> Zn where R = C <sub>4</sub> H <sub>9</sub> etc. 2.3 IMO/UN Designation: 6.1/1893 2.4 DOT ID No.: Not listed. 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 51550
<b>3. HEALTH HAZARDS</b>  3.1 <b>Personal Protective Equipment:</b> Rubber gloves; safety glasses or face shield; dust respirator for solid form 3.2 <b>Symptoms Following Exposure:</b> (All commercially available members of this class have about the same health hazards.) Inhalation of dust can cause respiratory discomfort. Ingestion causes irritation of mouth and stomach. Contact with eyes causes moderately severe irritation. Contact with skin causes mild irritation. 3.3 <b>Treatment of Exposure:</b> INHALATION: move from exposure. INGESTION: if large amounts have been ingested, induce vomiting. EYES: flush with copious amounts of water; if irritation persists, consult a physician. SKIN: wash affected areas with soap and water. 3.4 <b>TLV-TWA:</b> Not listed. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 2; LD <sub>50</sub> = 0.5-5 g/kg 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Currently not available 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** 360°F C.C.  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur and phosphorus may form in fires.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction at ordinary temperatures  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Zinc accumulates in some organisms but is not considered to be bioconcentrative.  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical; 62% on inert filler.  
7.2 **Storage Temperature:** Below 66°C (150°F)  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open (flame arrester)  
7.5 **IMO Pollution Category:** B  
7.6 **Ship Type:** 3  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid or liquid  
9.2 **Molecular Weight:** 548 (approx.)  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.12–1.26 at 20°C (liquid)  
1.6 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Low

## NOTES

# ZINC DIALKYLDITHIOPHOSPHATE

ZDP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Mexacarbate Zactran Zectane Zextran	Solid, crystals or solution	White to tan	Odorless
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH SOLID.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Fire data not available. Usually dissolved in combustible liquid.		
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR SOLUTION. POISONOUS IF SWALLOWED, INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Contain  
Collection Systems: Pump; Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 **CG Compatibility Group:** Not listed.  
2.2 **Formula:** C<sub>12</sub>H<sub>18</sub>N<sub>2</sub>O<sub>2</sub>  
2.3 **IMO/UN Designation:** 6.1/1615 (>1%); 9/1615 (<1%)  
2.4 **DOT ID No.:** 2757  
2.5 **CAS Registry No.:** Currently not available  
2.6 **NAERG Guide No.:** 151  
2.7 **Standard Industrial Trade Classification:** 51471

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Natural rubber gloves, respirator or gas mask and goggles.  
3.2 **Symptoms Following Exposure:** EYES: Slight irritation. INGESTION, INHALATION, OR SKIN ABSORPTION: Nausea, vomiting, abdominal cramps, diarrhea, and excessive salivation and sweating. Lassitude and weakness. Rhinorrhea and tightness in chest. Loss of muscle coordination, fasciculations and muscle twitching, random jerky movements, incontinence, convulsions and coma. Death due to respiratory arrest of central origin, respiratory paralysis, intense bronchoconstriction or all three.  
3.3 **Treatment of Exposure:** Call a physician. Move to fresh air. If needed give artificial respiration or oxygen. Eyes: Irrigate with water or saline. SKIN: Wash with soap and water or better still with 95% ethyl alcohol. INGESTION: Gastric lavage or syrup of ipecac. OTHER: One to 4 mg atropine sulfate IM or IV. Repeat at 15-minute intervals until full atropinization.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 4; LD<sub>50</sub> below 50 mg/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** May produce carcinogenic material when metabolized.  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to skin.  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Currently not available  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Unstable to heat.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** 83.3 (calc.)  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** 23.0 (calc.)  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Currently not available  
5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
96-hour LC<sub>50</sub> for most common fish = 1.73-19.14 ppm  
48-hour LC<sub>50</sub> for fish food organisms = 0.01-0.076 ppm  
6.2 **Waterfowl Toxicity:** Oral duck LD<sub>50</sub> = 3 mg/kg Oral Canada goose LD<sub>50</sub> = 2.64 mg/kg Lesser Sandhill Crane LD<sub>50</sub> = 1.0-4.5 mg/kg  
6.3 **Biological Oxygen Demand (BOD):** At a rate of 10 mg of 0.1% solution in acetone per liter, 85% was gone after one week and all after two weeks.  
6.4 **Food Chain Concentration Potential:** Currently not available  
6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: -  
Damage to living resources: 4  
Human Oral hazard: 3  
Human Contact hazard: I  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** 93.3% 91% (technical)  
7.2 **Storage Temperature:** Currently not available  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Poison  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** II  
8.4 **Marine Pollutant:** Yes  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** P128  
8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL &amp; CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 222.29  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** 185°F = 85°C = 358.2°K  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** Currently not available  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** 7.67  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# ZECTRAN

ZEC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		C U R R E N T L Y  N O T  A V A I L A B L E

# ZINC FLUOROBORATE

ZFB

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Zinc fluoroborate solution		Liquid	Colorless	Odorless
		Sinks and mixes with water.		
Keep people away. Avoid contact with liquid. Notify local health and pollution control agencies. Protect water intakes.				
<b>Fire</b>	Not flammable.			
<b>Exposure</b>	CALL FOR MEDICAL AID.  LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $Zn(BF_4) \cdot H_2O$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: Not listed
- 2.5 CAS Registry No.: Currently not available
- 2.6 NAERG Guide No.: Not listed
- 2.7 Standard Industrial Trade Classification: 52384

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Rubber gloves; safety glasses or face shield
- 3.2 Symptoms Following Exposure: Ingestion may cause irritation or corrosion of the alimentary tract. Contact with eyes or skin causes irritation.
- 3.3 Treatment of Exposure: INGESTION: give gastric lavage, cathartics, and demulcents. EYES: flush with plenty of water; get medical attention. SKIN: flush with plenty of water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $LD_{50} = 0.5\text{-}5\text{ g/kg}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: Zinc accumulates in some organisms but is not considered to be bioconcentrative.
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Purified, 41% solution in water.
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed.
- 8.7 EPA Pollution Category: Not listed.
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Liquid
- 9.2 Molecular Weight: 238.98 (solute only)
- 9.3 Boiling Point at 1 atm: (approx.) 212°F = 100°C = 373°K
- 9.4 Freezing Point: Currently not available
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.45 at 20°C (liquid)
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ZINC FLUOROBORATE

ZFB

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	90.509		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	M I S C I B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# ZINC FORMATE

ZFM

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Formic acid, zinc salt		Solid crystals      White
		Sinks and mixes with water.
Wear goggles, self-contained breathing apparatus and rubber gloves. Notify local health and pollution control agencies. Protect water intakes.		
<b>Fire</b>	Fire data not available.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID Irritating to skin and eyes. If swallowed may cause nausea and vomiting. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.	
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $Zn(HCOO)_2 \cdot 2H_2O$   $Zn(CHO_2)_2$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: Not listed  
2.5 CAS Registry No.: 557-41-5  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 51374

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved respirator, rubber gloves, and safety goggles.  
3.2 **Symptoms Following Exposure:** EYES: May cause corneal opacity, iritis, conjunctivitis. SKIN: May be irritating. INGESTION: Nausea and vomiting.  
3.3 **Treatment of Exposure:** See a physician. EYES: Wash with copious amounts of water. SKIN: Wash with soap and water. INGESTION: Give 3 to 4 glasses of water, induce vomiting and consult a physician.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $LD_{50} = 0.5$  to 5 g/kg.  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water,  $CO_2$ , Dry chemical, Foam, or  $CCl_4$   
4.4 **Fire Extinguishing Agents Not to Be Used:** None  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Moderate hazard. May emit toxic fumes of zinc compounds.  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** No reaction  
5.3 **Stability During Transport:** Liquid  
5.4 **Neutralizing Agents for Acids and Caustics:** Neutralize with sodium hydroxide.  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
96-hour  $TL_{50}$  values ranged from 4.7 to 35.5 mg Zn/L  
24-hour  $TL_m$  for Bluegill is 175 ppm (formate).  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 62.4 mg/l Zn will cause a 50% drop in the 5 day BOD. 0.27 lb/lb, 5 days (formate)  
6.4 **Food Chain Concentration Potential:** Zn may accumulate slightly.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent.  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 191.45 Dihydrate; 155.41 anhydrous  
9.3 **Boiling Point at 1 atm:** Decomposes Loses 2  $H_2O$  at 140°C  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 2.207 at 20°C dihydrate  
2.368 anhydrous  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Exothermic  $-46.3$  Btu/lb =  $-25.7$  cal/g =  $-1.08 \times 10^5$  J/kg at 25°C  $-52$  Btu/lb =  $-29$  cal/g =  $1.2 \times 10^5$  J/kg at 15°C  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ZINC FORMATE

ZFM

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
70 80 90 100 110 120 130 140 150 160 170 180 190 200 210	5.656 7.933 10.211 12.489 14.767 17.044 19.322 21.600 23.878 26.156 28.433 30.711 32.989 35.267 37.544		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ZINC FLUORIDE

ZFX

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Zinc difluoride	Solid needles or crystals  Colorless to white  Sinks and mixes with water.
Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID OR DUST Irritating to eyes and nose. Harmful if swallowed. Move to fresh air. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{ZnF}_2$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 9158
- 2.5 CAS Registry No.: 7783-49-5
- 2.6 NAERG Guide No.: 151
- 2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Approved dust and fume respirator, skin and eye protection.
- 3.2 **Symptoms Following Exposure:** INHALATION: Irritation of nasal passages, dryness, and nose bleed. EYES: Irritation may occur. SKIN: Excessive exposure may cause a rash. INGESTION: Salty or soapy taste, salivation, nausea, burning or crampy abdominal pain, vomiting, diarrhea, dehydration, and thirst.
- 3.3 **Treatment of Exposure:** Call a physician. INHALATION: Remove from exposure. EYES: Flush with water. SKIN: Wash with soap and cold water. INGESTION: Gastric lavage with lime water or a 1% solution of calcium chloride. Give several ounces of lime water at frequent intervals. Milk may be substituted. Aluminum hydroxide gel may be used to bind fluoride.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 3;  $\text{LD}_{50} = 50$  to 500 mg/kg.
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Repeated exposures to excessive concentrations of fluorides may increase radiographic density of bones and eventually may be responsible for anatomical abnormalities.
- 3.10 **Vapor (Gas) Irritant Characteristics:** Not pertinent
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Currently not available
- 3.13 **IDLH Value:** Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available
- 4.2 **Flammable Limits in Air:** Currently not available
- 4.3 **Fire Extinguishing Agents:** Currently not available
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available
- 4.5 **Special Hazards of Combustion Products:** Currently not available
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Currently not available
- 4.8 **Electrical Hazards:** Currently not available
- 4.9 **Burning Rate:** Currently not available
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:** No reaction
- 5.3 **Stability During Transport:** Slightly hygroscopic
- 5.4 **Neutralizing Agents for Acids and Cautics:** Currently not available
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** Fluoride salts are toxic to fish at concentrations as low as 2.3 ppm in fresh water. 96-hour  $\text{TL}_m$  values range from 4.7 to 35.5 mg Zn/l.
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** 62.4 mg/l Zn will cause a 50% drop in the 5 day BOD.
- 6.4 **Food Chain Concentration Potential:** Zn may accumulate slightly. Fluorine is accumulated by aquatic animals.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 103.38 (anhydrous salt)
- 9.3 Boiling Point at 1 atm:  $2732^\circ\text{F} = 1500^\circ\text{C} = 1773^\circ\text{K}$
- 9.4 Freezing Point: (Anhydrous salt)  $1601.6^\circ\text{F} = 872^\circ\text{C} = 1145^\circ\text{K}$
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: 4.84 at 15°C 4.95 at 25°C
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Estimated at BP  $1500^\circ\text{C}$  958.4 Btu/lb = 532.5 cal/g =  $22.3 \times 10^5$  J/kg
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Exothermic for anhydrous salt  $-227.8$  Btu/lb =  $-126.5$  cal/g =  $-5.3 \times 10^5$  J/kg
- 9.16 Heat of Polymerization: Currently not available
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ZINC FLUORIDE

ZFX

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77	1.650		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ZINC HYDROSULFITE

ZHS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Zinc dithionite	Amorphous solid	White	Slight SO#M2 odor
Mixes with water.			
Keep people away. Avoid contact with solid. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.			
<b>Fire</b>	Not flammable.		
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose, and throat. Move to fresh air.  SOLID Irritating to skin and eyes. If swallowed, will cause nausea and vomiting. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink plenty of water or milk and have victim induce vomiting.		
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $ZnS_2O_4$
- 2.3 IMO/UN Designation: 9/1931
- 2.4 DOT ID No.: 1931
- 2.5 CAS Registry No.: 7779-86-4
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52344

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask, chemical workers goggles, and rubber gloves.
- 3.2 Symptoms Following Exposure: INHALATION: Irritation of nose and throat. EYES: Mild irritant. SKIN: Irritant. INGESTION: Nausea and vomiting.
- 3.3 Treatment of Exposure: Call a physician. INHALATION: Move to fresh air. EYES: Wash with plain water or 2% solution of sodium bicarbonate. SKIN: Wash with soap and water. INGESTION: Dilute chemical and empty stomach with an emetic.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $LD_{50} = 0.5$  to  $5$  g/kg.
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Not pertinent
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not pertinent
- 4.3 Fire Extinguishing Agents: No fire hazard.
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Decomposes giving off irritating  $SO_2$
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Currently not available
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Contact with water liberates irritating  $SO_2$  gas.
- 5.2 Reactivity with Common Materials: Oxidizing agents and acids
- 5.3 Stability During Transport: Hygroscopic should be protected from moisture and heat.
- 5.4 Neutralizing Agents for Acids and Caustics: Neutralize with soda ash and NaOH.
- 5.5 Polymerization: Does not polymerize.
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 96-hour  $TL_{50} = 4.7$  to  $35.5$  mg Zn/l  
96-hour  $TL_{50}$  values in soft water:  $1$  mg Zn/l for Fathead minnow  $6$  mg Zn/l for Goldfish
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD):  $62.4$  mg Zn/l will cause a 50% drop in the 5 day BOD.
- 6.4 Food Chain Concentration Potential: Zn may accumulate slightly.
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 86% to 88%  $ZnS_2O_4$
- 7.2 Storage Temperature: Cool
- 7.3 Inert Atmosphere: Currently not available
- 7.4 Venting: Currently not available
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Class 9
- 8.2 49 CFR Class: 9
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at  $15^\circ\text{C}$  and  $1$  atm: Solid
- 9.2 Molecular Weight: 193.45
- 9.3 Boiling Point at  $1$  atm: Currently not available
- 9.4 Freezing Point: Currently not available
- 9.5 Critical Temperature: Currently not available
- 9.6 Critical Pressure: Currently not available
- 9.7 Specific Gravity: Currently not available
- 9.8 Liquid Surface Tension: Currently not available
- 9.9 Liquid Water Interfacial Tension: Currently not available
- 9.10 Vapor (Gas) Specific Gravity: Currently not available
- 9.11 Ratio of Specific Heats of Vapor (Gas): Currently not available
- 9.12 Latent Heat of Vaporization: Currently not available
- 9.13 Heat of Combustion: Currently not available
- 9.14 Heat of Decomposition: Currently not available
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ZINC HYDROSULFITE

ZHS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	28.000		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# ZIRCONIUM NITRATE

ZIR

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Zirconium nitrate pentahydrate	Solid  White  Odorless   Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Floor discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $Zr(NO_3)_4 \cdot 5H_2O$
- 2.3 IMO/IUN Designation: Not listed
- 2.4 DOT ID No.: 2728
- 2.5 CAS Registry No.: 13746-89-9
- 2.6 NAERG Guide No.: 140
- 2.7 Standard Industrial Trade Classification: 52359

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; protective gloves
- 3.2 Symptoms Following Exposure: Has only a mild pharmacological action. Inhalation of dust may irritate nose and throat. Contact with eyes or skin causes irritation.
- 3.3 Treatment of Exposure: INHALATION: Move to fresh air. INGESTION: Give large amount of water. EYES or SKIN: Flush with water.
- 3.4 TLV-TWA: 5 mg/m<sup>3</sup> (as zirconium)
- 3.5 TLV-STEL: 10 mg/m<sup>3</sup> (as zirconium)
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2; oral LD<sub>50</sub> = 2.5 g/kg (rat)
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: 50 mg/m<sup>3</sup> (as zirconium)
- 3.14 OSHA PEL-TWA: 5 mg/m<sup>3</sup> (as zirconium)
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable but may intensify fire
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire.
- 4.6 Behavior in Fire: May increase intensity of fire when in contact with combustible materials.
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Dissolves to give an acid solution
- 5.2 Reactivity with Common Materials: Will corrode most metals
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Flush with water
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: Currently not available
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Commercial; 99+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer
- 8.2 49 CFR Class: 5.1
- 8.3 49 CFR Package Group: III
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	0
Flammability (Red).....	0
Instability (Yellow).....	0
Special (White).....	OX
- 8.6 EPA Reportable Quantity: 5,000 pounds
- 8.7 EPA Pollution Category: D
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 429.3
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: Not pertinent
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: >1 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ZIRCONIUM NITRATE

ZIR

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	V E R Y  S O L U B L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T



# ZINC ACETATE

ZNA

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Acetic acid, zinc salt Dicarbomethoxyzinc Zinc acetate dihydrate Zinc diacetate	Solid  White  Faint vinegar odor  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{Zn}(\text{C}_2\text{H}_3\text{O}_2)_2$  or  $\text{Zn}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 9153  
2.5 CAS Registry No.: 557-34-6  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 51371

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Bu. Mines approved respirator; rubber gloves; chemical goggles  
3.2 **Symptoms Following Exposure:** Inhalation causes mild irritation of nose and throat, coughing, and sneezing. Ingestion can cause irritation or corrosion of the alimentary tract, resulting in vomiting. Contact with dust causes irritation of eyes and mild irritation of skin.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air; if exposure is severe, get medical attention. INGESTION: induce vomiting, followed by prompt and complete gastric lavage, cathartics, and demulcents. EYES: flush with water for at least 10 min.; consult physician if irritation persists. SKIN: wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5\text{-}5 \text{ g/kg}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:** Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Not pertinent  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 0.88 ppm/96 hr/fathead minnow/ $\text{TL}_m$ /soft water  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** Currently not available  
6.4 **Food Chain Concentration Potential:** Zinc is not considered to be bioconcentrative even though it accumulates in some organisms.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent, 99%; Commercial, 98.4%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 1000 pounds  
8.7 **EPA Pollution Category:** C  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 219.49  
9.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 1.74 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** (approx.)  $-0.5 \text{ Btu/lb} = -0.3 \text{ cal/g} = -0.01 \times 10^6 \text{ J/kg}$   
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ZINC ACETATE

ZNA

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	29.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ZINC NITRATE

ZNT

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Zinc nitrate hexahydrate	Solid  White  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Call fire department. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Will increase the intensity of a fire. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Flood discharge area with water.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $Zn(NO_3)_2 \cdot 6H_2O$
- 2.3 IMO/UN Designation: 5.1/1514
- 2.4 DOT ID No.: 1514
- 2.5 CAS Registry No.: 7779-88-6
- 2.6 NAERG Guide No.: 140
- 2.7 Standard Industrial Trade Classification: 52359

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves.
- 3.2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract. Contact with eyes causes irritation, which may be delayed. Contact with skin causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: induce vomiting, followed by prompt and complete gastric lavage, cathartics, and demulcents. EYES: flush with water; consult a physician. SKIN: wash with soap and water.
- 3.4 **TLV-TWA:** Not listed.
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Grade 2; oral  $LD_{50} = 2,500$  mg/kg (rat)
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** Causes enlarged liver, spleen, and bone marrow in rabbits
- 3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available
- 3.11 **Liquid or Solid Characteristics:** Currently not available
- 3.12 **Odor Threshold:** Odorless
- 3.13 **IDLH Value:** Not listed.
- 3.14 **OSHA PEL-TWA:** Not listed.
- 3.15 **OSHA PEL-STEL:** Not listed.
- 3.16 **OSHA PEL-Ceiling:** Not listed.
- 3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.
- 4.6 **Behavior in Fire:** May increase intensity of fire when in contact with combustible material
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
1.89 ppm/3 mo./ tadpoles/survived but no limb buds/fresh water  
32 ppm/48 hr./barnacles/90% lethal/salt water
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:**  
Zinc is accumulated in some organisms but is not considered to be bioconcentrative.
- 6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Reagent; Technical
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Open
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Oxidizer
- 8.2 49 CFR Class: 5.1
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	0
Instability (Yellow).....	0
Special (White).....	OX
- 8.6 EPA Reportable Quantity: 1,000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 297.47
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: 97°F = 36°C = 309°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 2.07 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ZINC NITRATE

ZNT

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	95.059		N O T		N O T		N O T
36	96.730						
38	98.400						
40	100.099						
42	101.700		P E R T I N E N T		P E R T I N E N T		P E R T I N E N T
44	103.400						
46	105.099						
48	106.700						
50	108.400						
52	110.099						
54	111.700						
56	113.400						
58	115.099						
60	116.700						
62	118.400						
64	120.099						
66	121.700						
68	123.400						
70	125.099						
72	126.700						
74	128.400						
76	130.099						
78	131.699						
80	133.400						
82	135.099						
84	136.699						

# ZINC POTASSIUM CHROMATE

ZPC

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Potassium zinc chromate Zinc yellow Y-539-D	Solid, powder Yellow Odorless
Sinks and mixes with water.	
Keep people away. AVOID CONTACT WITH POWDER. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Fire data not available.
<b>Exposure</b>	CALL FOR MEDICAL AID.  SOLID AND DUST Irritating to skin, eyes, nose and throat. Harmful if inhaled or swallowed. Move to fresh air. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife agencies. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge Contain Collection Systems: Pump; Dredge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $K_2CrO_4 \cdot ZnCrO_4$ 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: Not listed 2.5 CAS Registry No.: Currently not available 2.6 NAERG Guide No.: Not listed 2.7 Standard Industrial Trade Classification: 52431
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Respirator, gloves, glasses and protective clothing. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Irritation of nasal passages and respiratory tract. EYES: Irritation. SKIN: Irritation. INGESTION: Irritation or corrosion of alimentary tract, circulatory collapse and toxic nephritis. 3.3 <b>Treatment of Exposure:</b> Call a physician. INHALATION: Remove from exposure. EYES: Flush with plenty of water for at least 15 minutes. SKIN: Flush with water. INGESTION: Induce vomiting, follow by prompt and complete gastric lavage, catharsis, and demulcents. 3.4 <b>TLV-TWA:</b> 0.01 mg/m <sup>3</sup> as Cr. 3.5 <b>TLV-STEL:</b> Not listed. 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; LD <sub>50</sub> = 50 to 500 mg/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Chromates may cause lung cancer. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Currently not available 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Odorless 3.13 <b>IDLH Value:</b> Not listed. 3.14 <b>OSHA PEL-TWA:</b> Not listed. 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> 0.1 mg/m <sup>3</sup> as CrO <sub>3</sub> 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:** Currently not available  
4.2 **Flammable Limits in Air:** Currently not available  
4.3 **Fire Extinguishing Agents:** Water  
4.4 **Fire Extinguishing Agents Not to Be Used:** Currently not available  
4.5 **Special Hazards of Combustion Products:** Currently not available  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Currently not available  
4.8 **Electrical Hazards:** Currently not available  
4.9 **Burning Rate:** Currently not available  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:** Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available  
5.5 **Polymerization:** Will not occur.  
5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** 96-hour TL<sub>50</sub> values in soft water varied from 1 mg Zn/l for the fathead minnow to 6 mg Zn/l for the Goldfish.  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** 62.4 mg Zn/l will cause a 50% drop in the 5 day BOD.  
6.4 **Food Chain Concentration Potential:** Both Cr and Zn are concentrated by some organisms but are not considered to be bio-concentrative in a spill situation.  
6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Zn 30.8% Cr 23.5% K 9.1%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** Currently not available  
7.4 **Venting:** Currently not available  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** Not listed.  
8.7 **EPA Pollution Category:** Not listed.  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Not listed

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** Currently not available  
9.3 **Boiling Point at 1 atm:** Currently not available  
9.4 **Freezing Point:** Currently not available  
9.5 **Critical Temperature:** Currently not available  
9.6 **Critical Pressure:** Currently not available  
9.7 **Specific Gravity:** 3.40 to 3.60  
9.8 **Liquid Surface Tension:** Currently not available  
9.9 **Liquid Water Interfacial Tension:** Currently not available  
9.10 **Vapor (Gas) Specific Gravity:** Currently not available  
9.11 **Ratio of Specific Heats of Vapor (Gas):** Currently not available  
9.12 **Latent Heat of Vaporization:** Currently not available  
9.13 **Heat of Combustion:** Currently not available  
9.14 **Heat of Decomposition:** Currently not available  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# ZINC POTASSIUM CHROMATE

ZPC

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E		C U R R E N T L Y  N O T  A V A I L A B L E

# ZIRCONIUM POTASSIUM FLOURIDE

ZPF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Potassium fluozirconate Potassium hexafluorozirconate Potassium zirconium fluoride	Solid crystals      Colorless  Sinks and mixes with water.
Avoid inhalation. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Harmful if inhaled. Move to fresh air.  SOLID Harmful if swallowed. Irritating to skin. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: $K_2ZrF_6$ 2.3 IMO/UN Designation: Not listed 2.4 DOT ID No.: 9162 2.5 CAS Registry No.: 16923-95-8 2.6 NAERG Guide No.: 171 2.7 Standard Industrial Trade Classification: 52310
<b>3. HEALTH HAZARDS</b> 3.1 <b>Personal Protective Equipment:</b> Rubber gloves, safety glasses. 3.2 <b>Symptoms Following Exposure:</b> INHALATION: Irritation, nose bleed possible. SKIN: May cause granulomatous reactions. INGESTION: Burning pain in the mouth and throat, vomiting, watery or bloody diarrhea, retching anuria, liver damage and collapse. 3.3 <b>Treatment of Exposure:</b> Call a physician. INHALATION: Move to fresh air. EYES: Flush with large amount of water for 15 minutes. Seek medical attention. SKIN: Wash with soap and water. INGESTION: Dilute with water or milk. Remove by gastric lavage or vomiting. Give milk or starch drink to relieve irritation. Call a physician. 3.4 <b>TLV-TWA:</b> 5 mg/m <sup>3</sup> (as zirconium) 3.5 <b>TLV-STEL:</b> 10 mg/m <sup>3</sup> (as zirconium) 3.6 <b>TLV-Ceiling:</b> Not listed. 3.7 <b>Toxicity by Ingestion:</b> Grade 3; LD <sub>50</sub> = 50 to 500 mg/kg. 3.8 <b>Toxicity by Inhalation:</b> Currently not available. 3.9 <b>Chronic Toxicity:</b> Suppressed growth and caused thickening interalveolar lung septa in rats. May cause erythematous, papular and granulomatous reactions on skin. 3.10 <b>Vapor (Gas) Irritant Characteristics:</b> Not pertinent 3.11 <b>Liquid or Solid Characteristics:</b> Currently not available 3.12 <b>Odor Threshold:</b> Currently not available 3.13 <b>IDLH Value:</b> 50 mg/m <sup>3</sup> (as zirconium) 3.14 <b>OSHA PEL-TWA:</b> 5 mg/m <sup>3</sup> (as zirconium) 3.15 <b>OSHA PEL-STEL:</b> Not listed. 3.16 <b>OSHA PEL-Ceiling:</b> Not listed. 3.17 <b>EPA AEGL:</b> Not listed	

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Not pertinent
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** Not flammable
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not flammable
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction
- 5.2 **Reactivity with Common Materials:**  
Currently not available
- 5.3 **Stability During Transport:** Stable
- 5.4 **Neutralizing Agents for Acids and Caustics:** Currently not available
- 5.5 **Polymerization:** Currently not available
- 5.6 **Inhibitor of Polymerization:** Currently not available

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Fluoride salts are toxic to fish at concentration as low as 2.3 ppm
- 6.2 **Waterfowl Toxicity:** Currently not available
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Fluorine is concentrated by aquatic animals.
- 6.5 **GESAMP Hazard Profile:** Not listed

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Currently not available
- 7.2 **Storage Temperature:** Currently not available
- 7.3 **Inert Atmosphere:** Currently not available
- 7.4 **Venting:** Currently not available
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.
- 8.2 **49 CFR Class:** Not pertinent
- 8.3 **49 CFR Package Group:** Not listed.
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:** Not listed
- 8.6 **EPA Reportable Quantity:** 1000 pounds
- 8.7 **EPA Pollution Category:** C
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 283.41
- 9.3 **Boiling Point at 1 atm:** Currently not available
- 9.4 **Freezing Point:** 1724°F = 840°C = 1113.2°K
- 9.5 **Critical Temperature:** Currently not available
- 9.6 **Critical Pressure:** Currently not available
- 9.7 **Specific Gravity:** 3.48 at room temperature
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:** Not pertinent
- 9.14 **Heat of Decomposition:** Currently not available
- 9.15 **Heat of Solution:** Currently not available
- 9.16 **Heat of Polymerization:** Currently not available
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# ZIRCONIUM POTASSIUM FLOURIDE

ZPF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
40	1.856		N		N		N
50	3.202		O		O		O
60	4.548		T		T		T
70	5.893						
80	7.239		P		P		P
90	8.584		E		E		E
100	9.930		R		R		R
110	11.275		T		T		T
120	12.621		I		I		I
130	13.966		N		N		N
140	15.312		E		E		E
150	16.658		N		N		N
160	18.003		T		T		T
170	19.349						
180	20.694						
190	22.040						
200	23.385						
210	24.731						



# ZINC PHOSPHIDE

ZPP

## CAUTIONARY RESPONSE INFORMATION

### Common Synonyms

Solid Grey to black Faint odor

Sinks in water.

Evacuate.  
Keep people away. Avoid contact with solid and dust.  
Notify local health and pollution control agencies.  
Protect water intakes.

### Fire

Not flammable.  
Irritating gases may be produced when heated.

### Exposure

CALL FOR MEDICAL AID.  
DUST  
Irritating to eyes, nose and throat.  
If inhaled will cause dizziness, difficult breathing, or loss of consciousness.  
If in eyes, hold eyelids open and flush with plenty of water.  
If breathing has stopped, give artificial respiration.  
If breathing is difficult, give oxygen.

SOLID  
POISONOUS IF SWALLOWED.  
Irritating to skin and eyes.  
If swallowed will cause dizziness, nausea, vomiting or loss of consciousness.  
Remove contaminated clothing and shoes.  
Flush affected areas with plenty of water.  
IF IN EYES, hold eyelids open and flush with plenty of water.  
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.  
IF SWALLOWED and victim is UNCONSCIOUS, OR HAVING CONVULSIONS, do nothing except keep victim warm.

### Water Pollution

Effect of low concentrations on aquatic life is unknown.  
May be dangerous if it enters water intakes.  
Notify local health and wildlife officials.  
Notify operators of nearby water intakes.

## 1. CORRECTIVE RESPONSE ACTIONS

Stop discharge  
Collection Systems: Dredge

## 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $Zn_3P_2$
- 2.3 IMO/UN Designation: 6.1/1714
- 2.4 DOT ID No.: 1714
- 2.5 CAS Registry No.: 1314-84-7
- 2.6 NAERG Guide No.: 139
- 2.7 Standard Industrial Trade Classification: 52492

## 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask or self-contained breathing apparatus; goggles or face shield; protective gloves
- 3.2 **Symptoms Following Exposure:** When inhaled or ingested, compound releases phosphine, which causes faintness, weakness, nausea, vomiting, dyspnea, fall in blood pressure, change in pulse rate, diarrhea, intense thirst, convulsions, paralysis, and coma. Contact with eyes or skin causes irritation.
- 3.3 **Treatment of Exposure:** INHALATION: move to fresh air; give artificial respiration if required; get medical attention for phosphine poisoning. INGESTION: give one tablespoonful of mustard in a glass of warm water; repeat until vomit fluid is clear; avoid use of all oils; call physician immediately; have patient lie down and keep warm. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 4; oral  $LD_{50} = 40 \text{ mg/kg (rat)}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

## 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable
- 4.2 **Flammable Limits in Air:** Not flammable
- 4.3 **Fire Extinguishing Agents:** Use water, foam, or dry chemical on adjacent fires.
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Any agent with an acid reaction (e.g., carbon dioxide or halogenated agents) will liberate phosphine, a toxic and spontaneously flammable gas.
- 4.5 **Special Hazards of Combustion Products:** Irritating oxides of phosphorus may be formed in fires.
- 4.6 **Behavior in Fire:** Currently not available
- 4.7 **Auto Ignition Temperature:** Not pertinent
- 4.8 **Electrical Hazards:** Not pertinent
- 4.9 **Burning Rate:** Not pertinent
- 4.10 **Adiabatic Flame Temperature:** Currently not available
- 4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.
- 4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

## 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Reacts slowly with water, more rapidly with dilute acid, to form phosphine gas, which is toxic and spontaneously flammable.
- 5.2 **Reactivity with Common Materials:** Currently not available
- 5.3 **Stability During Transport:** Stable unless exposed to moisture; toxic phosphine gas may then be released and collect in closed spaces.
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

## 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available
- 6.2 **Waterfowl Toxicity:** 1,285 ppm  $LC_{50}$
- 6.3 **Biological Oxygen Demand (BOD):**  
Currently not available
- 6.4 **Food Chain Concentration Potential:**  
Zinc is accumulated by some organisms but is not considered to be bioconcentrative.
- 6.5 **GESAMP Hazard Profile:**  
Bioaccumulation: 0  
Damage to living resources: 3  
Human Oral hazard: 3  
Human Contact hazard: II  
Reduction of amenities: XX

## 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 94+%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Pressure-vacuum
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** Currently not available
- 7.7 **Barge Hull Type:** Currently not available

## 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Dangerous When Wet
- 8.2 **49 CFR Class:** 4.3
- 8.3 **49 CFR Package Group:** I
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	3
Flammability (Red).....	3
Instability (Yellow).....	1
- 8.6 **EPA Reportable Quantity:** 100 pounds 100 pounds
- 8.7 **EPA Pollution Category:** B
- 8.8 **RCRA Waste Number:** P122
- 8.9 **EPA FWPCA List:** Yes

## 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid
- 9.2 **Molecular Weight:** 258.10
- 9.3 **Boiling Point at 1 atm:**  $2,012^{\circ}\text{F} = 1,110^{\circ}\text{C} = 1,373^{\circ}\text{K}$
- 9.4 **Freezing Point:** (sublimes)  $788^{\circ}\text{F} = 420^{\circ}\text{C} = 693^{\circ}\text{K}$
- 9.5 **Critical Temperature:** Not pertinent
- 9.6 **Critical Pressure:** Not pertinent
- 9.7 **Specific Gravity:** 4.55 at  $13^{\circ}\text{C}$  (solid)
- 9.8 **Liquid Surface Tension:** Not pertinent
- 9.9 **Liquid Water Interfacial Tension:** Not pertinent
- 9.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 9.12 **Latent Heat of Vaporization:** Not pertinent
- 9.13 **Heat of Combustion:**  $-4,100 \text{ Btu/lb} = -2,270 \text{ cal/g} = -95 \times 10^3 \text{ J/kg}$
- 9.14 **Heat of Decomposition:** Not pertinent
- 9.15 **Heat of Solution:** Not pertinent
- 9.16 **Heat of Polymerization:** Not pertinent
- 9.17 **Heat of Fusion:** Currently not available
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** Currently not available

## NOTES

# ZINC PHOSPHIDE

ZPP

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B I L E		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ZINC PHENOLSULFONATE

ZPS

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Zinc phenolsulfonate octahydrate Zinc p-phenolsulfonate Zinc sulfofencarboxylate Zinc sulfofencarboxylate	Solid  White  Odorless   Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Irritating gases may be produced when heated.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $(1, 4\text{-HOC}_6\text{H}_4\text{SO}_3)_2\text{Zn} \cdot 8\text{H}_2\text{O}$   
2.3 IMO/IUN Designation: Not listed  
2.4 DOT ID No.: 9160  
2.5 CAS Registry No.: 127-82-2  
2.6 NAERG Guide No.: 171  
2.7 Standard Industrial Trade Classification: 51639

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust mask; goggles or face shield; protective gloves  
3.2 **Symptoms Following Exposure:** Inhalation of dust may irritate nose and throat. Ingestion of large doses has emetic and astringent effects; can cause irritation or corrosion of the alimentary tract. Contact with eyes causes irritation. Contact with skin causes mild irritation.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: if large amount has been swallowed, induce vomiting, followed by prompt and complete gastric lavage, cathartics, and demulcents. EYES or SKIN: flush with water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Grade 2;  $\text{LD}_{50} = 0.5\text{-}5 \text{ g/kg}$   
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Odorless  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur may form in fires.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** No reaction  
5.2 **Reactivity with Common Materials:**  
Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):**  
Currently not available  
6.4 **Food Chain Concentration Potential:**  
Zinc is accumulated by some organisms but is not considered to be bioconcentrative.  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Purified  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Not listed.  
8.2 **49 CFR Class:** Not pertinent  
8.3 **49 CFR Package Group:** Not listed.  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 555.8  
9.3 **Boiling Point at 1 atm:** (decomposes) 248°F = 120°C = 393°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** >1 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Not pertinent  
9.16 **Heat of Polymerization:** Not pertinent  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ZINC PHENOLSULFONATE

ZPS

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68	63.000		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

# ZINC SULFATE

ZSF

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> White vitriol Zinc sulfate heptahydrate Zinc vitriol	Solid  White  Odorless  Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.
- 2.2 Formula:  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$
- 2.3 IMO/UN Designation: Not listed
- 2.4 DOT ID No.: 9161
- 2.5 CAS Registry No.: 7733-02-0
- 2.6 NAERG Guide No.: 171
- 2.7 Standard Industrial Trade Classification: 52349

### 3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Dust mask; goggles or face shield; protective gloves
- 3.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract. Contact with eyes or skin causes irritation.
- 3.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: induce vomiting, followed by prompt and complete gastric lavage, cathartics, and demulcents. EYES or SKIN: flush with water.
- 3.4 TLV-TWA: Not listed.
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: Not listed.
- 3.7 Toxicity by Ingestion: Grade 2;  $\text{LD}_{50} = 0.5\text{-}5 \text{ g/kg}$
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available
- 3.10 Vapor (Gas) Irritant Characteristics: Currently not available
- 3.11 Liquid or Solid Characteristics: Currently not available
- 3.12 Odor Threshold: Currently not available
- 3.13 IDLH Value: Not listed.
- 3.14 OSHA PEL-TWA: Not listed.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

### 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
- 4.5 Special Hazards of Combustion Products: Not pertinent
- 4.6 Behavior in Fire: Currently not available
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent.
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent.
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: Currently not available
- 5.3 Stability During Transport: Stable
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: Not pertinent

### 6. WATER POLLUTION

- 6.1 Aquatic Toxicity: 0.3 mg/l as Zn/120 hr/stickleback/lethal\*/ 4.6 ppm/96 hr/rainbow trout/LC<sub>50</sub>/fresh water  
\*Water type not specified
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): None
- 6.4 Food Chain Concentration Potential: Zinc is accumulated by some organisms but is not considered to be bioconcentrative.
- 6.5 GESAMP Hazard Profile: Not listed

### 7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Reagent; Technical
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Not listed.
- 8.2 49 CFR Class: Not pertinent
- 8.3 49 CFR Package Group: Not listed.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm: Solid
- 9.2 Molecular Weight: 287.54
- 9.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 9.4 Freezing Point: (decomposes) 122-212°F = 50-100°C = 323-373°K
- 9.5 Critical Temperature: Not pertinent
- 9.6 Critical Pressure: Not pertinent
- 9.7 Specific Gravity: 1.96 at 20°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 9.12 Latent Heat of Vaporization: Not pertinent
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

### NOTES

# ZINC SULFATE

ZSF

9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
	N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
34	42.280		N		N		N
36	42.950		O		O		O
38	43.630		T		T		T
40	44.310						
42	44.990		P		P		P
44	45.670		E		E		E
46	46.340		R		R		R
48	47.020		T		T		T
50	47.700		I		I		I
52	48.380		N		N		N
54	49.050		E		E		E
56	49.730		N		N		N
58	50.410		E		E		E
60	51.090		N		N		N
62	51.770		T		T		T
64	52.440						
66	53.120						
68	53.800						
70	54.480						
72	55.150						
74	55.830						
76	56.510						
78	57.190						
80	57.870						
82	58.540						
84	59.220						

# ZINC SILICOFLUORIDE

ZSL

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Zinc fluosilicate Zinc hexafluorosilicate Zinc silicofluoride hexahydrate	Solid  White  Odorless   Sinks and mixes with water.
Keep people away. Avoid contact with solid and dust. Notify local health and pollution control agencies. Protect water intakes.	
<b>Fire</b>	Not flammable. Irritating gases may be produced when heated.
<b>Exposure</b>	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  SOLID POISONOUS IF SWALLOWED. Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
<b>Water Pollution</b>	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.

### 1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse  
Stop discharge

### 2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: Not listed.  
2.2 Formula:  $\text{ZnSiF}_6 \cdot 6\text{H}_2\text{O}$   
2.3 IMO/UN Designation: Not listed  
2.4 DOT ID No.: 2855  
2.5 CAS Registry No.: 16871-71-9  
2.6 NAERG Guide No.: 151  
2.7 Standard Industrial Trade Classification: 52310

### 3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Dust respirator; chemical goggles or face shield; protective gloves  
3.2 **Symptoms Following Exposure:** Inhalation of dust irritates nose and throat; excessive inhalation may cause severe pulmonary inflammation. Ingestion causes nausea, cramps, vomiting, shock, convulsions, cyanosis, and other symptoms of fluoride poisoning. Contact with eyes or skin causes irritation; skin ulcers may develop.  
3.3 **Treatment of Exposure:** INHALATION: move to fresh air. INGESTION: cause vomiting by giving soapy water or mustard water; have patient drink large quantities of lime water, if necessary, give stimulant such as strong coffee. EYES: flush with water; call physician as necessary. SKIN: wash with soap and water.  
3.4 **TLV-TWA:** Not listed.  
3.5 **TLV-STEL:** Not listed.  
3.6 **TLV-Ceiling:** Not listed.  
3.7 **Toxicity by Ingestion:** Oral  $\text{LD}_{50}$  = 100 mg/kg (rat)  
3.8 **Toxicity by Inhalation:** Currently not available.  
3.9 **Chronic Toxicity:** Currently not available  
3.10 **Vapor (Gas) Irritant Characteristics:** Currently not available  
3.11 **Liquid or Solid Characteristics:** Currently not available  
3.12 **Odor Threshold:** Currently not available  
3.13 **IDLH Value:** Not listed.  
3.14 **OSHA PEL-TWA:** Not listed.  
3.15 **OSHA PEL-STEL:** Not listed.  
3.16 **OSHA PEL-Ceiling:** Not listed.  
3.17 **EPA AEGL:** Not listed

### 4. FIRE HAZARDS

- 4.1 **Flash Point:**  
Not flammable  
4.2 **Flammable Limits in Air:** Not flammable  
4.3 **Fire Extinguishing Agents:** Not pertinent  
4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent  
4.5 **Special Hazards of Combustion Products:** Toxic and irritating hydrogen fluoride and silicon tetrafluoride are formed in fires.  
4.6 **Behavior in Fire:** Currently not available  
4.7 **Auto Ignition Temperature:** Not pertinent  
4.8 **Electrical Hazards:** Not pertinent  
4.9 **Burning Rate:** Not pertinent  
4.10 **Adiabatic Flame Temperature:** Currently not available  
4.11 **Stoichiometric Air to Fuel Ratio:** Not pertinent.  
4.12 **Flame Temperature:** Currently not available  
4.13 **Combustion Molar Ratio (Reactant to Product):** Not pertinent.  
4.14 **Minimum Oxygen Concentration for Combustion (MOCC):** Not listed

### 5. CHEMICAL REACTIVITY

- 5.1 **Reactivity with Water:** Not flammable  
5.2 **Reactivity with Common Materials:**  
Currently not available  
5.3 **Stability During Transport:** Stable  
5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent  
5.5 **Polymerization:** Not pertinent  
5.6 **Inhibitor of Polymerization:** Not pertinent

### 6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:**  
Currently not available  
6.2 **Waterfowl Toxicity:** Currently not available  
6.3 **Biological Oxygen Demand (BOD):** None  
6.4 **Food Chain Concentration Potential:**  
Zinc is accumulated by some organisms but is not considered to be bioconcentrative  
6.5 **GESAMP Hazard Profile:** Not listed

### 7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Technical, 98-99%  
7.2 **Storage Temperature:** Ambient  
7.3 **Inert Atmosphere:** No requirement  
7.4 **Venting:** Open  
7.5 **IMO Pollution Category:** Currently not available  
7.6 **Ship Type:** Currently not available  
7.7 **Barge Hull Type:** Currently not available

### 8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Keep Away From Food  
8.2 **49 CFR Class:** 6.1  
8.3 **49 CFR Package Group:** III  
8.4 **Marine Pollutant:** No  
8.5 **NFPA Hazard Classification:** Not listed  
8.6 **EPA Reportable Quantity:** 5000 pounds  
8.7 **EPA Pollution Category:** D  
8.8 **RCRA Waste Number:** Not listed  
8.9 **EPA FWPCA List:** Yes

### 9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Solid  
9.2 **Molecular Weight:** 315.5  
9.3 **Boiling Point at 1 atm:** (decomposes)  
122–158°F = 50–70°C = 323–343°K  
9.4 **Freezing Point:** Not pertinent  
9.5 **Critical Temperature:** Not pertinent  
9.6 **Critical Pressure:** Not pertinent  
9.7 **Specific Gravity:** 2.10 at 20°C (solid)  
9.8 **Liquid Surface Tension:** Not pertinent  
9.9 **Liquid Water Interfacial Tension:** Not pertinent  
9.10 **Vapor (Gas) Specific Gravity:** Not pertinent  
9.11 **Ratio of Specific Heats of Vapor (Gas):**  
Not pertinent  
9.12 **Latent Heat of Vaporization:** Not pertinent  
9.13 **Heat of Combustion:** Not pertinent  
9.14 **Heat of Decomposition:** Not pertinent  
9.15 **Heat of Solution:** Currently not available  
9.16 **Heat of Polymerization:** Currently not available  
9.17 **Heat of Fusion:** Currently not available  
9.18 **Limiting Value:** Currently not available  
9.19 **Reid Vapor Pressure:** Currently not available

### NOTES

# ZINC SILICOFLUORIDE

ZSL

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35 40 45 50 55 60 65 70 75 80 85 90	51.343 51.775 52.208 52.640 53.073 53.505 53.938 54.371 54.803 55.236 55.668 56.101		N O T  P E R T I N E N T		N O T  P E R T I N E N T		N O T  P E R T I N E N T